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EDITORIAL NOTES.

HENRY EDWARD JONES.

THE announcement in last week's "JOURNAL" of the death of Mr. Henry Edward Jones has been received throughout the gas industry with profound sorrow, for he had an individuality in our midst which endeared him to us all. The members of the family have the consolation of knowing that their grief is shared by countless friends in the industry. The end was unexpected. We all knew that our friend had journeyed through his eightieth year; his intimates realized that he was about to complete his eighty-second year. But the vigour of mind and body to the finish seemed a contradiction of the four-score years and more. The passing fitted the life—it might almost be said to have been characteristic of it; for until just before the silent call, Mr. Jones had been pursuing the activities of, for him in latter years, a normal day. He had in early morning been interesting himself in business matters associated with at any rate one of the gas undertakings with which he was administratively concerned; he had had a run with the Essex hounds—the greatest of his pleasures and recreations. Only the space of thirty minutes parted usual activity and final rest.

A vacant place has been made in our midst which cannot be filled; for we know of no one in the industry possessing the same composite traits as our departed friend. The length of personal experience in all the ramifications of the gas industry, the fundamental and detailed knowledge of its affairs, the devoted application of that knowledge in administrative and professional capacity, taken together, remained almost without rival as the little group of front rank contemporaries left the scene of their labours. Mixed with those qualities and the wisdom with which they were used and applied, were wit and an irrepressible cheerfulness—even in gloomy and stressful days. We have known that Mr. Jones could be brusque and plain spoken; we always knew that what he said he meant and what he meant he said. Never, however, did he hesitate to praise when deserved. He was a sportsman and large-hearted. Those who were trained under him for the gas profession—his "boys"—have to thank him for his insistence on application and discipline; and among them we do not know of a single one who in after life did not thank their "lucky stars" that they were brought up on the engineering and managerial regimen of "H. E. J." They ever afterwards looked upon him as their guide, philosopher, and friend; and he was the first to whom they turned when in need of counsel. On the several Boards of which he was Chairman or an ordinary member—mostly the former—his fellow administrators will sadly miss him. His sound common-sense, his technical advice, his outspoken criticisms, his quick discernment and ability to make prompt decisions, and his plainness in expressing his views, together with his fine geniality, caused his colleagues to have an admiration for him of a nature which age and experience alone could not have commanded. In administrative work he progressed with time's changes; he never allowed the traditions of the past to cling about him and impede his movements. He was always for advance. "Cheap gas" was a favourite term which in his practices was translated into reality—anyway, to the utmost extent to which he could carry it in the circumstances of the times. In the quest for means of realizing this dominant object, and in his practices, he was keen on securing and maintaining a low capital account. A low capital account and cheap gas were close companions in his mind and actually. But he did not seek a low capital per unit of production by starving works or purchasing inefficient plant. There was a strong belief in the wisdom of spending to secure efficiency; but he found the point where economic efficiency ended, and declined to pay an uneconomic price for any efficiency beyond.

Above all things Mr. Jones was an engineer; and he was proud of his profession—not only so, he was jealous of it. But pride and jealousy alone will not take a man to the highest pinnacles of such a profession. There must be ability of pronounced and varied order. That ability was a possession of our late friend which took him to a foremost place in the profession. Not only gas engineers, but his compeers in other branches of engineering recognized his talent; and they were proud—as he felt the distinction and the honour—to have him in the Presidential Chair of the Institution of Civil Engineers. As a consulting engineer he had a large practice, even before he relinquished the office of Chief Engineer and General Manager of the Commercial Gas Company, and went to Westminster. His advice was much sought; and his presence in the Parliamentary Committee rooms in connection with Private Gas Bills was constant in the old days, before the war and Special Orders interrupted the former normal course of things. In the past half century, there has been no great gas fight affecting the general interests of the industry in which he has not been concerned—always on the side of the industry, never against it. He was one of the gas engineering and administrative experts whom eminent leaders at the Parliamentary Bar preferred to have with and not against them. There was nothing subtle about him or his evidence. Its quality and soundness, its openness and frankness, impressed and were persuasive, and carried weight with the Committees of both Houses. A great power in the industry has finished its course.

We look back over a considerable stretch of years in which "H. E. J." has had such prominent place and (until now) an unceasing part in the work of the industry. So inseparably associated with gas affairs has he become in our minds that it is difficult to believe that he is no longer with us. We shall all miss him; but, while sorrow at his loss will remain, his gifts and charming characteristics, and what he has taught and done, will be imperishable and happy memories with those of us among whom he has lived and moved. *Vale!*

A Matter of Pressing Importance.

THE Presidential Address to which the members of the Southern District Association of Gas Engineers and Managers listened last Tuesday week was the work of an observer and a student of the trend of things in the gas industry, and withal a keen worker in its interests. Mr. Philip G. G. Moon, the Engineer and General Manager of the Bournemouth Gas and Water Company, in preparing the address, concentrated his thoughts on those affairs that are of immediate outstanding concern to the industry; and he led up to them by referring, with modesty but gratification, to the remarkably fine record that the Bournemouth Company can show of progress in their gas supply business. This has necessitated the construction of new works at Pitwines, which incorporate several imposing features of engineering interest, about which

there will be an opportunity of saying more on a future occasion. The record of gas progress at Bournemouth has about it a robust and genial aspect; but it is merely a reflection of what is going on all over the country, subject to the limitations set by local conditions. However, the prosperity in regard to gas sales (which, it is hoped, will not be interrupted by the current set-back in the markets for secondary products) must not cause us to close our eyes to, or simply to smile complacently upon, what is going on around us in the political world, aided and abetted by both subterranean and open fostering by our principal competitors, who are trying, on congenial soil, to obtain an advantage to the disadvantage of the gas industry. It may be considered by some that the far higher efficiency of the gas process in relation to the utilization of our fuel supply is a sufficient palladium against anything that can be done through political avenues in favour of our electrical competitors. That is partially, but by no means completely, true. Therefore it must be the business of the gas industry in the first place to do what it can to resist the conferring of any exclusive advantage on the electricity industry which, if there is realization, must in some degree (to what extent no one can predict) be to the detriment of the gas industry, if it takes the form of preferential treatment—say, through subsidization. But apart from direct effects, we detect beneath the words in the address of the President and in the remarks by Sir Arthur Duckham at the close of its reading, an appeal for the consideration of the matter from a higher point of view—and that a national one—by an industry which is, through the utilization of coal, doing immeasurably more in the service of the country than are the public electricity supply undertakings (apart from traction). When an industry such as ours sees that mistakes are being made, when we have within our keeping the proof that they are mistakes, and are the fruits of misconception and misguidance, then it is a duty and a responsibility to correct them. If we do not do this with boldness and perseverance, if we lose an opportunity of promulgating the truth, then we are betraying our trust, and should deserve all the unwelcome results which lethargy brought upon us.

The President pointed out that there are many political men who do not realize the more important place occupied by gas than electricity in the economy of the country's fuel supplies, while acknowledging that electricity has a sphere of service which it can and does fill with advantage to the community, but real advantage can only be within that sphere. The ignorance in this regard that prevails among some politicians is well illustrated by a privately expressed statement of a prominent member of Parliament, that he has no place for the consideration of anything but electricity where light, heat, and power are concerned; also by the book on "Coal and Power" which bore the name of Mr. Lloyd George; by the attitude of the late Labour-Socialist Government; as well as by certain expressions of opinion by present Ministers. The facts as to the efficiency of the utilization of coal by the gas process and by the electrical, as vividly presented in Mr. Moon's address, are unknown to the bulk of our legislators; and therefore no wonder that the glamour which has been so sedulously thrown round electricity has taken hold of them. The gas industry cannot altogether exonerate itself from blame in this regard. It is true that we had an invaluable report from Sir Dugald Clerk and Professors Smithells and Cobb which demonstrated the comparative efficiencies of the two processes; but has sufficient widespread use been made of that report, or of plainly stated data such as are found in Mr. Moon's address? He takes the figures applying to electricity supply in this country in 1923. The fuel used amounted to 7,356,757 tons, and from that coal the equivalent of 169·4 million therms was produced—the average consumption of coal being 3·32 lbs. per kw.h. Assuming that coal had been used at twice the efficiency, the output in therms would have been only 338·8 millions. Using that same quantity of coal in the gas process, at 70 therms per ton 515 million therms would have been produced as gas and 989 million therms as coke, to say nothing of tar and sulphate of ammonia. The coke, if turned into producer gas, and used for the generation of electricity, would generate 2747 million units of electricity. "The moral," says the President, "is obvious." Do our legislators know these facts? Have they been placed before them in a manner which they as laymen in these matters can understand? We think not.

We have to get well beyond what has been done. Sir Arthur Duckham says that while the gas industry has very fine specialized propaganda, he does not believe that any of us have formulated in our minds how a programme of fuel development in the country should be put forward from the national point of view. He says, as is also stated in the address, that a small Committee of distinguished men have been appointed for this purpose. This is good and satisfactory; and the hope he expresses, that the Committee will come to really sound conclusions, will, we are sure, run through the industry, because up to now the fuel problem has not been handled soundly in this country—it has only been treated from a very narrow point of view. But the industry has to get its economic facts home; has to show the country that a greater extravagance in providing for its heat requirements is simply a flight to further national uneconomy and inefficiency. Mr. Moon is favourable to very broad action. His opinion, which will be powerfully backed in the industry, is that co-ordinated effort is required, and he proceeds:

> I think the time is over-ripe for the formation of a permanent Committee drawn from the leading administrators, engineers, scientists, and publicists of the industry, whose definite duty it should be to impress upon the country by means of lectures by eminent scientists, by newspaper articles and pamphlets, and by representations to all political parties, the fundamental thermal facts of gas manufacture and electricity generation and their effect upon the nation's fuel resources. I hope my remarks will not be interpreted as in any way belittling the great and growing importance of electricity and the part it plays in the home and industrial life of the nation.

Those remarks were written before there was knowledge on the President's part as to the appointment of a Committee; but they show the feeling of one influential engineer, and that it is not solitary is testified by the action of the Manchester Institution of Gas Engineers in addressing a communication to the other Associations regarding the much-talked-of subsidizing of the electricity industry out of national funds, as well as by the resolution passed at the largely attended Southern meeting. The latter recorded that the members had heard with pleasure of the formation of a Committee of distinguished men to consider the position; and it urged that the Committee should take the necessary steps to impress the position upon the country by means of lectures, newspaper articles, &c., and most particularly by putting the true economic facts with regard to both industries before Members of Parliament. It was also submitted that the latter action should be taken without delay, as the members of the Association feel that, while the gas industry has nothing to fear from the fair competition of the electrical industry, the booming of the latter for political purposes, if allowed to proceed further without strong opposition, can only end disastrously for the country as a whole. This shows that the gas profession will be prepared to give the strongest possible support to a full and vigorous policy which will have counteractive effect upon political misconceptions and proposals in this regard.

That the matter requires speeding-up and prosecuting in a broadcast manner is seen from the debate on unemployment in the House last Thursday. In the febrific imaginations of some of our politicians, electrical development is the cure for all our troubles. On the occasion referred to, Sir A. Steel Maitland said: "The real scheme, *which "is profitable on every conceivable ground,* is the electricity scheme. That scheme is being pressed forward "as rapidly as possible, but no human being could get "through a scheme of that elaboration in a short time." Does that reflect the views of the whole Government? We do not know; but the Minister of Transport has been talking of electricity a good deal in public lately in a somewhat similar confident way. The case for the widespread promulgation of genuine facts is beyond dispute, so that a halt may be called in order to examine the facts from

a national point of view, and not in the partial, incomplete, and unsatisfactory way which is at present being pursued in Government circles. The National Gas Council are moving. One thing we would strongly emphasize is that whatever is done the facts must be presented in a manner which can be popularly understood. In this respect, the clarity of Mr. Moon's data is a model for further and wider application.

Chemical Manufacturers and the Gas Industry.

There are two points about their Bill in Parliament upon which the Gas Light and Coke Company may be heartily congratulated. The measure proposes the largest individual amalgamation which has ever taken place in the gas industry, by the incorporation of the Brentford Gas Company in the gigantic premier undertaking. In the large area which will thus be created under the one gas-supply jurisdiction, there are numerous local authorities, who without doubt have given to the scheme the minutest scrutiny aided by expert advice, with the result that, although there were originally 35 petitioners against the Bill, none put in an appearance before the House of Commons Committee last week. The only opponents were the Alkali Manufacturers' Association, one of whose main ambitions in life is to shackle the gas industry as much as possible in order to serve their own ends and interests, instead of those of the millions of gas consumers of the country. The first matter for congratulation to the Gas Light and Coke Company therefore is the complete endorsement given by the numerous local authorities to the scheme of amalgamation. The second point for felicitation is that the Alkali Manufacturers' Association did not gain anything by their interference. If leading Counsel for the Company (Mr. H. P. Macmillan, K.C.) is correct in his surmise, it is necessary to look deeply beneath the surface to find the real reason why the Association were there at all; and the suggestion is that their move has on this occasion some connection with the Deuchar litigation, which seeks to prevent the Gas Light Company making caustic soda for the purpose of working-up their own secondary products. In that the chemical manufacturers have failed in the High Court and the Court of Appeal, and, pursuing the Company to the fullest extremes, they are now taking the case to the House of Lords. The idea was, if they could succeed in their desire before the Commons Committee, a useful advantage would have been obtained which would have helped them in the litigation.

The position is almost farcical. The Brentford Gas Company in their Gas Order of 1924 had the one-third residuals purchase clause placed upon them, with the usual proviso that they may "purchase from other gas undertakers and elsewhere, and use, the materials required to work up and convert the residual products so arising from their own manufacture of gas, or purchased as aforesaid;" but "shall not manufacture chemicals exclusively from raw materials purchased from sources other than gas undertakings or in the manufacture of which the use of residual products produced by the Brentford Company or purchased from other gas undertakings is merely subsidiary." This clause the Gas Light Company proposed should be repealed, on the ground that the Bill intended that the Brentford area of supply should come under the legislative code of the Gas Light Company, which Company have no power to purchase secondary products from other concerns, and they do not desire it. They have sufficient of their own. The chemical manufacturers wished to retain and not repeal something that the Gas Light Company do not want, even though the clause only applied to the Brentford area. This being so, there was a motive, which we think was fairly well revealed by the proceedings. To have retained the clause would have complicated matters; the object of the Bill being centralization and concentration, and not to make the conditions of working more complex in the interests of the chemical manufacturers. But it was very clear before the discussion ended that it was the proviso, and not the one-third restriction, which was the real objective of the opposition. In the view of the Governor of the Company (Mr. D. Milne Watson) if the proviso was placed upon the Company, it would deprive them of existing powers on the faith in which large sums of money have been expended; and, among other things, it would have the effect of preventing their manufacturing caustic soda for the working-up of their own residuals. The chemical manufacturers do not appear to have had the candour to acknowledge at the outset what was the exact object of their opposition; but, before the hearing concluded, their Counsel admitted that the proviso at the end of the clause was the thing that would handicap the Company. Truth will out; and so the surmise of Mr. Macmillan was correct. The Committee very properly sent the chemical manufacturers empty away. It is a singular thing that Parliament should ever allow any interference with the carrying on of gas undertakings to the best advantage in the public interests, in order to further the private interests of the chemical manufacturers. It is absurd to contend that the liberty enjoyed by them should not be allowed to gas companies as public utility concerns; inasmuch as the maximum economy and efficiency at which the latter can be worked is, through the sliding-scale, to the advantage of the public.

New Gas Producing Plant and Old Purification Methods.

The gas profession, as is well known, has been deeply indebted to a succession of occupants of the office of Chief Alkali Inspector and the members of their staff. The happy relations that have always existed between them and the chief technical officers of gas undertakings are due to the reciprocal feeling that both are out for the purpose of securing the highest efficiency in the operations which come under the surveillance of the Chief Inspector's Department, in view of the fact that, through such efficiency, the conditions can be fully preserved which it is the main function of the inspectors to see are duly observed. In such matters it is an excellent tradition of the Department that it is always better to realize the end by good understanding than by autocratic control or the application of compulsory method. The latter is only exercised when there is deliberate and flagrant evasion of conditions and regulations. It was a happy thought which led to the invitation to Dr. T. Lewis Bailey, the Chief Inspector of Alkali Works, and Mr. F. Napier Sutton to be present at the luncheon of the Southern District Association of Gas Engineers and Managers on Tuesday of last week. In the course of the after-luncheon proceedings, Dr. Bailey proposed the toast of the Association; and in doing so he made a suggestion which we think is worthy of consideration and investigation by gas engineers and chemists.

The work of the Chief Inspector has necessitated his studying gas making in its modern forms; and he says it has led him to the conclusion that gas engineers have been going ahead as fast as they could by altered and improved methods of making gas, but he is rather afraid that, in doing this, they have not considered to the extent they should have done the question of whether the new methods require any modification of the subsequent processes. Dr. Bailey's exact words were: "Gas engineers "have stuck their new methods of making gas on to their "old methods of cleaning it; but is this right? It is a sug- "gestion I throw out; and I think I am justified in doing "so. Is there not a vast field to be explored in the cleaning "of gas—that is, in the treatment of the gas after it comes "from the retorts, and before it leaves the works?" Now that the point has been raised, it has to be acknowledged that during the past decade the composition of gas as it passes from the retort-house in its crude state has been altered considerably with good economic effect, but not always, regarded chemically, in respect of the distribution plant and appliances. Further, the admission has to be made that there has been no definite and general investigation as to whether or not the condensing, washing, and other purification plant and processes are the best that could be devised for dealing with the gas of the present day. The only thing that can be said, apart from other chemical considerations, is that, within the limits of statutory decrees as to purity and quality of gas, testings are now carried out more rigorously than they were beforetimes, and that very little complaint is to-day heard of any infraction of the standards laid down. However, Dr.

Bailey's point is a good one, and deserves thorough investigation to ascertain the answer that should be given to his question, "Is this right?"

Smoke Abatement and Gas and Electricity.

The District Conferences of the "B.C.G.A." have started with a good swing at Leicester and Greenock. A sketch of the proceedings in the former town was given in our columns last week; and an account of the Greenock meeting appears to-day. One thing that particularly strikes us about these conferences is the immense enthusiasm that is shown in the work by the municipal authorities—especially by those owning both gas and electricity undertakings. There is no question that among them there is spreading a strong appreciation of the part they should and must take, to fulfil thoroughly their functions in fostering to the utmost atmospheric conditions which will promote the health of the community and, through enhanced cleanliness, the amenities of the cities and towns over which they have governmental jurisdiction. There is also an extending understanding of the potentialities and the limitations of the rival methods of accomplishing this work. Everything must be done to advance this knowledge; and it is clear from what Mr. F. W. Goodenough said at Leicester that this is one of the salient components to-day in the policy of the Association. The lines of the conferences so far held, and we take it the same will apply to those which are to follow, show this to be so. The knowledge is not confined to the members of municipal authorities; it is gaining ground among the public. But the public, regarded apart from their municipal representatives, look upon heating by gas more from the labour-saving and convenience points of view than from that of atmospheric purity. What is happening among the public is that never in the whole history of the gas industry has there been such a long continuity of high-level demand for gas appliances, and the result is seen in the universal report of a considerable demand for gas, notwithstanding industrial depression. This is going on despite the activity of the electrical people in urging the public to adopt electric cooking and heating.

There are two points in a speech made at the Leicester conference by our friend, Mr. Councillor George E. Hilton, the Chairman of the Corporation Gas Committee, to which we should like to make brief reference. He remarked that there was no doubt that legislation to speed-up smoke abatement was urgently required, though they would have to wait until next session before getting it. We agree as to the urgency, especially if the Bill that is passed empowers—as did the Bill which was on its journey when the late Government relinquished office—local authorities to make by-laws requiring new houses to be provided with cooking and heating arrangements of a non-smoke producing order. But there is no reason why municipal authorities should wait for legislation before actively engaging in work which will assist in bringing about a great reform. The second point is that "at present the annual home consumption of coal is in the neighbourhood of 180 million tons, and of this considerably more than three-quarters is burned in a raw state. When talking of smoke abatement, there is no need therefore to waste time in arguing the merits of gas and electricity. There is ample scope for both to make all the inroads they can upon the 75 p.ct. of the fuel consumption which consists in burning raw coal." In part we agree with Councillor Hilton; in part we do not. We are of opinion that, in the national interests, when talking of smoke abatement it is necessary to consider the merits of gas and electricity in order that a proper perspective may be obtained, and that the country may not be led into making provision for accomplishing a prodigal waste of fuel through the application of electricity to general heating, and thus incidentally rendering the country poorer than it is to-day. There is not ample scope, even in the cause of smoke abatement, for the utilization of more coal at a lower efficiency than now obtains by its use in other ways. The combined thermal losses in electricity generation and transmission are so great that for ordinary heating purposes electricity can never take the place of gas—all it can do is to indulge in a little pretence that it is doing something effective on the outskirts of the work. Moreover, for general heating (being a seasonal and not a continual requirement) it would necessitate provision in generating and transmission plant which would be idle for a large part of the year, and thus another uneconomy which would have to be borne by the electricity undertakings and the consumers—or perchance the ratepayers.

It is no use for the purpose of displaying in public an unprejudiced mind, or a diplomacy having for its object the protection of the feelings of our electrical friends, to indulge in the ignoring of facts, or in the concealment of knowledge. It is because this has been done in the past that misconceptions exist so extensively in the political mind. It is well to look the facts squarely in the face, and, having done so, to accept the position as it is found, and as it can be proved to be. That position is that the treatment of coal by the gas industry presents the largest economy to the nation of any suggested method of attacking the smoke problem; and no words can affect the truth of this. Everybody connected with the gas industry has (to use words culled from the paper of Mr. James Paterson, M.A., at the Leicester conference) "a great civic duty . . . . to lead the people of these islands to the realization of the glorious vision of clean towns and cities, and a healthy population revelling in the enjoyment of pure and unpolluted atmosphere."

Special Benevolent Fund Appeal.

The President of the Institution of Gas Engineers (Mr. J. Ferguson Bell) is making a special appeal on behalf of the Benevolent Fund. It is addressed to those members who so far are not subscribers, and to those who are for increased subscriptions. The Fund has proved of incalculable benefit to many of those unhappily left unprovided for; and, in addition, special grants are made to meet urgent cases of need. At a recent meeting of the Committee of Management of the Fund, fifteen grants were made, which will amount to £517 during the year. The total estimated expenditure will be about £600. The total of the subscriptions received from members last year was only £272, donations £90, and interest on investments £139—giving a total income of £501, so that unless members' subscriptions are increased this year by at least £100, it will be necessary to draw upon reserves, and grants in future will require to be curtailed. This the President knows is not the wish of the members. We trust the appeal will bear good fruit.

Permanent Summer Time.

The Summer Time Bill has been before a Standing Committee of the House of Commons. An unsuccessful attempt was made to alter the period in the measure—the first Sunday in April to the first Sunday in October—to the third Sunday in April and the third Sunday in September. It will be impossible for the Bill to affect the commencement of summer time this year; and therefore the Home Office will issue the customary Order, which will fix the date from the third Sunday in the month—April 19.

Virgin Soil.

Many gas shareholders will have received a well-printed prospectus, containing four pages of wording which is not worth the highly respectable paper on which it is printed. The style is excellent, the substance of the prospectus distinctly thin. The high-sounding title of the new venture is the Southern Counties Electric Light and Power Company, Ltd. The document bears the stamp of the National Scheme for Disabled Men, which term does not necessarily include disabled investors. It is to be a rich Company, with a capital of £46,000, and offices in London, Brighton, Eastbourne, Bournemouth, Exeter—the registered offices being in Bournemouth. All the places named are well supplied with electricity. The £46,000 is divided into 20,000 8½ p.ct. participating preference shares of £1 each, 20,000 ordinary shares of 1s. each, and 2500 first mortgage 7 p.ct. debentures of £10 each. The Company require at present merely a paltry £35,000, for carrying out a contract with the Electricity Finance and Distribution Company, Ltd., of 43, Cannon Street, to buy a plot of land for a generating station for £80 at Sturminster-Newton, to buy from Jenner & Simpson, of Battle, an elec-

tricity undertaking there for £2500, to purchase a piece of land and battery building at Battle for £400, the preliminary expenses due to the Electricity Finance and Distribution Company estimated at £1000, and administrative expenses and cash loans on account of contracts, &c., estimated at £1800, exclusive of legal charges. The preliminary and other expenses, estimated at £4000, amount to more than the sum to be paid for the Battle undertaking! By the way, the urban district of Battle is included in the Extension Order of the Hastings Corporation, now before the Electricity Commissioners. Another contract has been made with the Chagford and Devon Electric Light Company (one, we believe, of the 43, Cannon Street hatchings) to take from them electricity in bulk. If there are fools enough to supply the £35,000, the Company should have a good margin of spare cash. But we do not think that anybody who knows the history of these promotions will put money into such a flimsy affair as this. We see that the dear old Baronet has again been installed in the chair—Sir Charles B. H. Soame. He is on so many "Boards" now, and Chairman of so many, that he cannot have much leisure time. Mann, Martin, Bennett-Calvert, and Brigden are other names on the Board. W. Thompson, of 43, Cannon Street, again figures as the Solicitor, and C. A. Turner & Co. (whose reports as Auditors are consistently favourable to these ventures) have enlarged their clientele by the addition of this Company. Why is it that the name of Eaton does not appear so frequently on these documents in these times as it used to do in other days? Has it lost its magnetic power?

Economy of 20-Ton Wagons.

The economy of 20-ton wagons where they can be used has led to a further concession by the Great Western Railway to users at the South Wales ports. In addition to the rebate of 5 p.ct. allowed off the conveyance rates, the charge for tipping and weighing coal in fully loaded 20-ton wagons at the docks owned by the Company will be at the rate of 6d. a ton (instead of the ordinary charge of 7½d.)—a decided advantage in favour of the high-capacity wagon. It is reported that the use of the new wagons will be considerably extended during the present year.

Factory Legislation.

It is announced that the Home Secretary has definitely made up his mind that it will be impossible to introduce a Factory Bill this session; but appropriate legislation is under consideration, and will be placed before Parliament at a later period. It is stated that the Home Office view is that the factory legislation of the country is already the best in the world, and that for various reasons it would be inopportune at present to introduce a set of entirely fresh proposals. We are inclined to think the job is a bigger one than the Government are, in the present state of public affairs, willing to tackle.

Coal Mines' Inquiry.

The Joint Committee of coal owners and representatives of the Miners' Federation met nearly a fortnight ago, and had a long discussion on the vital questions of output per shift worked and the costs of production. Figures were laid before the Committee as to the cost of production in the English coalfields as compared with the cost in Germany and other Continental and American coalfields. The importance of the English figure approximating to those in competing coalfields was stressed, not only as regards the export trade, but in its effect upon other industries in which coal is a raw material. The Committee will meet again to-day and to-morrow. The representatives of the miners are proposing to criticize the amounts paid to general managers, managers, and secretarial staffs, which suggests that there are likely to be some lively passages.

Miners' Minimum Wages.

The House of Commons last Friday on sound grounds refused to give a second reading to the Bill promoted by the Miners' Federation to fix a minimum wage of 12s. per shift for miners. The House declined to establish a rigid minimum, which would withdraw from those directly concerned the power to settle their own affairs in consultation and conference on conditions prevailing at any given time. The House heard information as to the severe competition that British coal is to-day receiving from foreign produce; and the members also learned that, if the Bill was passed, it would raise the average cost of production by 2s. or 3s. per ton, and in some centres by 4s. and 5s.

PERSONAL.

Two officials of the Burnley Corporation Gas Department, Mr. A. B. Munro (Showroom Manager) and Mr. G. Langstreth (Assistant to the Gas Engineer), are leaving, the former having accepted a position as Sales Superintendent to the Edinburgh Corporation, and the latter going as Deputy Engineer to Todmorden. On Wednesday, March 25, Mr. J. H. Clegg, the Gas Engineer, presented each with a solid silver cigarette case, a pipe, and a pouch.

Mr. John Whitaker, Indoor Superintendent to the Bradford Corporation Gas Department, who retired on March 31 after 48 years' service, was presented on March 26 with a handsome silver cigar box and a cigarette case, the gifts of the members of the Gas Committee. Among those who spoke appreciatively of his work were Mr. George Walker, Chairman of the Gas Committee; Mr. J. H. Barraclough, ex-Chairman; and Mr. Charles Wood, Gas Engineer and General Manager. Mr. Whitaker is succeeded by Mr. J. W. Horwill, the newly-elected Hon. Secretary of the Yorkshire Junior Gas Association.

At a smoking concert in the dining hall of the Gas Light and Coke Company's Chief Office in Horseferry Road, on Tuesday of last week, a presentation was made to Mr. H. Dodimead, Chief Lamp Inspector, who retired on March 31. Mr. F. W. Goodenough (Controller of Gas Sales), in making the presentation, referred to the long and honourable service of nearly 46 years which Mr. Dodimead had rendered to the Company, during 21 years of which he had served under him as Chief Lamp Inspector. He referred to the fact that Mr. Dodimead expected to celebrate his Silver Wedding in the present year, and therefore the gifts that they were asking him to accept were particularly appropriate. They wished him and his wife good health in their retirement, so that they might have a chance of celebrating their Golden Wedding. Mr. Dodimead, in reply, expressed the sincere thanks of his wife and himself for the magnificent gifts. He also wished to thank, on his own behalf, the whole of the public lighting staff for their loyalty and devotion to duty during the years he had been at the head of that department. He could truly say that, thanks to this good service, the street lighting in the Company's district was second to none. The gifts comprised a solid silver coffee service and Wedgwood cups and saucers, from the workmen and staff of the department; a massive silver tray, from the office staff of the Company; a leather suit case, from the Local Managers and Inspectors-in-Charge; and a pair of silver candle-sticks for Mrs. Dodimead, from the workmen and staff.

OBITUARY.

Mr. J. Marshall Thomas, ex-Mayor of Penryn, Cornwall, died last Friday at the age of 75. As Chairman of the Penryn Gas Company, he performed valuable work in the borough.

The death of Mr. T. S. S. Gardner, of Kidderminster, at the age of 77 years, is announced. For many years he served on the Ledbury Urban District Council; and he was a Director of the Ledbury Gas Company, of which he was Secretary for about nine years.

Departure of the Prince for West Africa.

The following telegram was addressed to H.R.H. the Prince of Wales previous to his departure on Saturday last: "Institution of Gas Engineers send you loyal greetings praying that your tour may be as successful in promotion of world's good fellowship as previous tours. Wishing you God-speed. Ferguson Bell, President." A reply was received as follows: "Sincere thanks to the Institution for good wishes. Edward P." The Secretary, Mr. W. T. Dunn, represented the Institution at Victoria Station during the departure of His Royal Highness.

Gas at the Pit's Mouth.—Discussing low-temperature carbonization before the Franklin Institute, Dr. H. C. Porter remarked that proposals are often made, in connection with projected large-scale power development, or central station arrangement for gas, at the coal mines, to utilize some process whereby the coal is gasified completely, with a bye-product of tar and possibly ammonia. Duplex plants are possible, using low-temperature carbonizing retorts together with gas producers or water gas generators, or a single combination process. It is problematical whether such central gas-distributing stations, by the use of cheap coal and the saving of a certain amount of tar oils and ammonia, could thereby secure sufficient advantage to off-set the high cost of the gas-distributing mains and the carbonization plant investment.

HENRY EDWARD JONES.

1843—1925.

The gas industry has suffered a serious loss by the death of Mr. Henry Edward Jones, who passed away at his home, Marden Ash House, Ongar, Essex, on the afternoon of Tuesday, March 24. Mr. Jones had been out riding that morning, and after luncheon had attended to several matters in connection with his Magistracy. He was preparing to go for a walk when he felt unwell; and although medical assistance was quickly forthcoming, he passed peacefully away in the presence of his daughter, Miss Ethel Jones, with whom he conversed to within a few minutes of his death.

Mr. Jones was born in Chester City in April, 1843, and was therefore nearly 82 years of age. He was the second son of Robert Jones, an eminent gas engineer of his time, who moved to Worcester in 1844, Bath 1845, Wolverhampton in 1846, and London in 1853, when appointed Engineer to the Commercial Gas Company.

He was educated at the City of London School and Stepney Grammar School, leaving in December, 1858, after passing with Honours the Cambridge Higher Local Examination. In 1859 he was articled to Joseph Beattie, the Locomotive Engineer of the South-Western Railway, and on the completion of his articles in 1862 commenced his professional career at the Harlow Gas-Works, Essex. After working as a student in Dr. Medlock's laboratory, and gaining practical experience at Pontypridd and Toddington, he was appointed, when 20 years of age, Engineer to the Wandsworth Company in 1863. He held this position until October, 1869, when he was appointed Engineer to the Ratcliff Company; but in the meantime he had paid professional visits in an advisory capacity to the Lisbon and Oporto Gas-Works (1863), Athens (1865), and Spain (1866). He married in April, 1865, and lived at Wandsworth until 1870, when he moved to East London, in order to be closer to his work.

In December, 1875, the Ratcliff Company amalgamated with the Commercial Company, and Mr. Jones was made Joint Engineer with his father. The Poplar Works of that Company were commenced in 1876; and on the retirement of Robert Jones in 1880, his son became Chief Engineer.

In 1902 Mr. Jones retired from the Commercial Company, and was elected to the Board of Directors, and in the meantime had moved to Marden Ash House, Ongar, where he lived until his death. He lost his father in 1896, and his wife in 1901.

During the later years at the Commercial Company, he had built-up a large consulting practice, and was Consulting Engineer to Eastbourne, Watford, Margate, Canterbury, Faversham, Dublin, European, Bombay, Primitiva, Whitstable, Woking, Enfield, Bishop's Stortford, and other Gas Companies too numerous to mention. He was, both before and after his retirement from active management, in great demand in parliamentary matters, rating cases, arbitrations, and such like. His intimate knowledge of the design and construction of works, the practical side of gas manufacturing and purification, and his administrative ability rendered his services as expert witness of immense value.

In September, 1888, he visited Boston (U.S.A.) on professional matters; and he was in personal touch with gas affairs on the Continent, in India, and in South America. He was prominent in the various classic fights relating to such matters as sulphur restrictions, burner Bills, and other legislation promoted to relieve the industry from cumbersome and costly obligations. He was engaged on rating cases for the old East London Water Company, and the Metropolitan Water Board.

Between 1905 and 1910 he gradually relinquished his consulting practice at Palace Chambers, Bridge Street, Westminster, and gave more attention to administration from the Directors' table. At the time of his death he was Chairman of the Wandsworth, Wimbledon, and Epsom District Gas Company, the European Gas Company (owning eight works in the North of France), the Bombay Gas Company, the Uxbridge, Wycombe, and Maidenhead Gas Company, the Primitiva Gas Company of Buenos Aires, and the Loddon Gas Company, and was Deputy-Chairman of the Commercial Company.

Mr. Jones was for many years Chairman of the Gas Companies' Protection Association, and took an active interest in its proceedings. He was one of the prime movers in the formation of the National Gas Council, and was first President. He was included for election this year as an honorary member of that body.

For many years he had been a prominent member of the Institution of Civil Engineers, having been admitted Associate in 1869, and transferred to membership in 1875. He was for a long period a member of the Council, and finally reached, in 1917, what must be the summit of every engineer's ambition—the Presidency of that Institution. Previous to his election to the Council, he had read three papers before the Institution—on the "Construction of Gas-Works" in 1875, "Purification of Gas" in 1880, and "Modern Practice in Manufacture of Gas" in 1900. He received several notable awards from the Institution, among which were the Telford Premium, the Watt Medal, and the George Stephenson Medal.

He was also a member of the Institution of Mechanical Engineers, having been admitted in 1878; and he was connected with the Benevolent Fund of this body. He delivered before the Institution in 1916 the Hawksley Lecture; the subject chosen being "Gas Engineers of the Last Century."

The deceased was, of course, an old and valued member of our own Institution of Gas Engineers, of which he was President in 1903-04; and he contributed from time to time to the proceedings. He presented the London Medal to the Institution, to be awarded annually for the best paper presented on a "subject of practical interest to gas engineers." One of his latest acts before his death was to transfer sufficient stock in one of his Companies to maintain the income for the permanent annual presentation of this medal.

Mr. Jones always took a lively interest in the politics of gas, and was a frequent contributor to the Technical Press on the topics of the day. For many years he was a Governor of the East London College and a Justice of the Peace for the County of Essex. A great outdoor sportsman, his favourite occupations were riding and hunting; and he won many point-to-point races and other events on his own horses—the first, on Knight in April, 1885, when he won the Essex Consolation Cup. The last was in April, 1896, when he won the heavy point-to-point on Colonel; his age at that time being 53 years. He was a great reader, and his library at Marden Ash bears testimony to his interests in country pursuits, local history of various parts of the country, science, and travel.

Two sons pre-deceased him, but he leaves two sons and three daughters. Mr. Frank Jones, M.Inst.C.E., is the well-known gas director and administrator; while Mr. Stanley Jones, M.Inst.C.E., is the Chief Engineer of the Commercial Gas Company, and is on the Directorate of the Oriental, Uxbridge, and Burnham Companies. His three daughters are Mrs. Ransome, Miss Mabel Jones, and Miss Ethel Jones. The last-mentioned lived with him at Ongar.

THE FUNERAL.

Probably in recent years, certainly not since the funeral of Sir George Livesey, have there assembled so many representing the varied interests of the gas industry as were present on Saturday at High Ongar, Essex, when the last solemn rites on the passing of the beloved doyen of the profession were observed. The occasion was a striking demonstration of the high regard and esteem which Mr. Jones had won from numerous friends by his sterling qualities and unquenchable enthusiasm in everything he undertook.

In addition to those associated with him in his life's work as a gas engineer, there were, of course, many others who knew him in his other activities. Notably his friends of the Essex Hunt attended, with their Secretary, to express their feelings of devotion to a staunch member and active supporter of the Hunt for a period of fifty years.

Among those of his engineering colleagues present were Dr. Charles Carpenter, C.B.E., President of the South Metropolitan Gas Company; Mr. J. Ferguson Bell, M.Inst.C.E. (President), Mr. Charles F. Botley, M.Inst.C.E. (Senior Vice-President), and Mr. Walter Dunn, M.I.Mech.E. (Secretary), of the Institution of Gas Engineers, of which Mr. Jones was President in the year 1903; Mr. Thomas Goulden, M.Inst.C.E., of the Gas Light and Coke Company; Mr. A. E. Broadberry, M.Inst.C.E., of the Tottenham District Light, Heat, and Power Company; Mr. Charles Hulme, of the Uxbridge, Maidenhead, Wycombe, and District Gas Company; Mr. Robert B. Anderson, of the Gas Companies' Protection Association; Mr. E. J. Fottrell, of the National Gas Council, of which Mr. Jones became the first President; Mr. Cyril M. Croft, of the Wandsworth, Wimbledon, and Epsom District Gas Company; Mr. Frank Bush, of the South Metropolitan Gas Company; Mr. George Evetts, M.Inst.C.E.; Mr. A. R. Burch, M.Inst.C.E., of the Bombay Gas Company; Mr. Robert Grant, J.P., of the Primitiva Gas Company; Mr. G. M. Gill, M.I.Mech.E.; and Mr. F. W. Cross, M.Inst.C.E.

Lord Lambourne, P.C., Lord Lieutenant of Essex, and Lady Colvin, wife of the former M.P. for West Essex, were present, as also Mr. H. C. Honey, Director of Gas Administration, Board of Trade.

The funeral service took place in St. Mary's Church, High Ongar, and was impressively conducted by the Rector, the Rev. G. R. Nesbitt, M.A., assisted by Canon Reeve, of Standon. The music, which was rendered by the small village choir, was arresting in its simplicity. Boys of the local Wolf Cub Pack with their Cub Master formed a Guard of Honour. The chief

mourners were Mr. Frank H. Jones and Mr. Stanley H. Jones. Numerous beautiful floral tributes were sent, among others by the Institution of Gas Engineers, the National Gas Council, the British Commercial Gas Association, and the Gas Companies' Protection Association.

Simultaneously with the interment at Ongar a memorial service was held at the Savoy Chapel, and was attended by many friends, including Mr. Basil Mott, C.B., Mr. D. Milne Watson, Mr. Charles Hunt, Mr. R. W. Edwards, Mr. Honoratus Lloyd, K.C., Mr. W. J. Smith, and Mr. J. C. Walker.

Henry Edward Jones, born April 26, 1843, died March 24, 1925, has left us poorer by his passing from us; his memory will ever be held in affectionate remembrance.

THE LATE MR. H. E. JONES ON A FAVOURITE MOUNT.

APPRECIATIONS.

Mr. Basil Mott, C.B., President of the Institution of Civil Engineers.

I have learned with deep regret of the death of my old friend, Harry E. Jones, on March 24.

His works as a gas engineer are well known; and during the whole of his long association with this Institution, as a member of Council, and as President in 1917-18, he rendered great service to the profession. It is difficult to exaggerate the loss all members of Council will feel at the death of one whose advice was always most willingly given, and was most helpful.

He was a gentleman and a sportsman in the highest meaning of the words, whose cheerful and kindly friendship endeared him to all who had the privilege of knowing him.

Mr. D. Milne Watson, President of the National Gas Council.

When the news reached us of the death of Mr. Harry Jones, we looked at each other startled, incredulous. It was as if the familiar light of day had become dimmed, a dismal fog of depression had crept up, blotting out the bright sunshine.

We can ill spare him—our dear old friend—the brightness of his nature, the never-failing encouragement of his hopefulness, his humour, his delightful whimsical letters that always brought with them a breath of that wonderful spirit.

Even in his business correspondence, he would urge one on by such expressions as "Tally-ho!" "For'ard on"—borrowed from his favourite sport. He hunted almost to the end, and was riding on the day of his death. And he was 82 years old! To how many of us is given that power of keeping the boy in us alive under the weight

of years, the benumbing influence of disappointments, disillusions, and *atra cura?* He brought to the industry in his forceful personality that fearless truthfulness which, though as he himself expressed it, sometimes led him into "blazing indiscretions," yet inspired all who had the privilege of his friendship with the spirit of enthusiasm that he shed around him, and made the hardest and most monotonous efforts emphatically worth while.

We can only show our appreciation of his character by keeping alive that spirit, hard as it will be without his brave heart to rely on, or his hand to grasp.

Dr. Charles Carpenter, C.B.E., M.Inst.C.E.

The death of Mr. Harry Jones robs the gas industry of its outstanding personality—I had, indeed, almost added, and of the last gas-maker. He was articled in the locomotive shops of one of the great railway companies, and there laid the foundation of that sound engineering knowledge which served him in good stead throughout his professional career. In those days, too, there were master locomotive-builders busily thrashing out the details of rolling stock construction from "Flying Dutchmen" to coal wagons; fighting the battles of crank *v.* straight axles, and so inside *v.* outside cylinders; iron or copper fireboxes; chain, air, or vacuum brakes, not forgetting the gauges—burning problems in those days, and needing all the inventive genius of the technician to furnish solutions, while maintaining all the while the safety of the travelling public. To-day locomotives are built all over the world and by all nations on lines which are well understood and in which improvements are made in detail rather than in principle. The master locomotive-builder is no more—his day has passed. In the same sense Harry Jones must be numbered among the master gas-makers of an era which, too, will not return. Who to-day remembers the controversies centering round such questions as ground floor *v.* stage retort house; cast *v.* rolled girders; dips *v.* anti-dips; faced *v.* luted lids; dry *v.* wet purification? The principles concerned in gas manufacture are to-day well understood, and the engineer has the knowledge of them at his fingers' ends; he has not to seek it in the dim labyrinths of the unknown. Let us give as an example an episode in the life of a gas engineer of those days. It is Sunday and he and his wife are starting out for church—one perchance of the many the great Sir Christopher built for our London forefathers, and which they were wont to attend with little-failing regularity. "I must have a look at that troublesome hydraulic, my dear. You go on; I will soon catch you up." From standing at the retort-house door talking to his foreman, the engineer is little by little drawn inside, and soon proceeds to elaborate his investigations by climbing on the "beds" in his silk hat and Sunday clothes. Then taking off his coat, he turns up his white linen shirt sleeves, and thrusts his arm through the manhole into the hydraulic main, getting very tar-stained in the process. To-day it is known why mains and arch-pipes may become blocked with pitch and carbon, but the engineer of Harry Jones' day had to learn these things for himself, and dig out the underlying causes. A differently constituted London from the present lived and worked in those days when only the well-to-do had the luxury of a gas supply, and gas cookers were practically unknown. The engineer's great domain was then his works, and the chief inspector kept in order the district up to the consumers' meters, beyond which not a finger was lifted to help.

Our friend was but a young man when he left Wandsworth to join the Ratcliffe Company, which had a separate existence on the banks of the Thames at Wapping, near by which ran the famous "Highway," with a gasholder station somewhere about Shadwell alongside the railway to Blackwall—a line worked first by rope haulage and later by steam, though in its passage through dockland its track had to be roofed-over to protect the neighbouring goods from engine sparks. It is just fifty years now since the Ratcliffe Company was absorbed by the Commercial Gas Company, which then became the first London sliding-scale gas undertaking; and Harry Jones was appointed Engineer of the joint concern. I think this fusion constituted the tide in his affairs which led to Fortune. The application for the first time, at any rate in the Metropolis, of the germ of the principle that business profits should depend upon business skill, even in the management of a gas undertaking, undoubtedly provided the turning-point in his career; and to the golden rules until then in force were added "Keep down your capital expenditure," and "Keep low the price of gas." The influence of this new attitude upon works construction was far-reaching, for the advocate of economical construction of new plant, and of the intelligent use of old plant, carried these principles not only to the Commercial Works, but far and wide in the extensive general practice he built up as a Consulting Engineer. Of his many contributions to technical literature, I would single out for special notice "Jones on the 'Purification of Gas'" and "The Illuminating Power of the Gas of the Future." The latter constituted one of the early forecasts of the future development of gas supply made possible by the extended use of the bunsen flame for incandescent gas lighting, and for cooking and heating appliances. The former won him a Watt Medal and a Telford Premium given by the Institution of Civil Engineers, of which body he was in later years elected to the Council, becoming President in 1917. His action in this latter episode was characteristic of the man. It was the duty of another member to take the chair in the troublous times then prevailing. But his health failed, and Harry Jones, with customary good nature, though his own business had become increasingly arduous, undertook the responsibilities of the presidency. It can be truly stated that no President enjoyed more fully the respect and affection of all his colleagues than he did. His constant thought was directed to maintaining unimpaired the high traditions of the Institution; and he always looked with a jealous eye upon any proposals to associate too intimately therewith the constructing element as distinct from the designing branch of civil engineering.

But Harry Jones was something more than a good engineer. He was an all-round man of the world who took unceasing pleasure in associating with his fellow men in all walks of life. His hunting proclivities are well known to all. "Jumping Jones" was for many a year his soubriquet in his county. He enjoyed steeplechasing, as to which he told at least one amusing story. He delighted in polo also; and while he may not have been the smartest player of the team, he was generally the most reliable, for although he was one of the best judges of a bottle of wine that I have met, he was abstemious in the highest degree, and was therefore always "fit" when his associates were sometimes a little "off colour."

When he was considering having his portrait painted, I urged him to sit to Orpen. The conversations of the artistic Dubliner would have helped to get those rugged features on the canvas toned to humour by reminiscences of horse shows and Punchestown. Failing this, I suggested Mullings, for the only characteristic likeness I have seen of him is a snapshot of himself on a favourite horse, when he looks his best. The Institution portrait is, in my opinion, like most of its companions, a poor counterfeit of the real personage it purports to present.

I have said Harry Jones was an all-round man. He was; and therein lay his charm and the secret of his success. He was as much at home with a peer as with a policeman, a countess or a songstress, and he had the right word to say to each. One of my pleasant recollections is of him standing in a doorway in Rennes to catch a glimpse of the "divine Sarah," then on one of her last journeys to Belle-Ile-en-Mer. I think his happiest holidays, of later years at any rate, were spent in France, in which country he was ever ready to find delight in her cathedrals, her chateaux, her galleries, and with her people. Had he belonged to that country he would long ago have been enrolled in her Legion of Honour. Being British, and neither a self-seeking politician nor a greedy profiteer, he died as he lived, plain Harry Jones. After all, "Kind hearts are more than coronets," as Robertson told us long ago; and to those who knew him best his was kindly and genial to the full. He was by nature deeply loving and affectionate; and despite his great age, his death will leave a gap, not easily filled, in many places. That the people of Ongar were among those who loved him, was shown by the drawn blinds throughout the village on the funeral afternoon. But even yet more impressive

was the absolute stillness and silence in the church as the Vicar read the chosen chapter from St. Paul's Epistles—almost as though all hearts present were beating quietly lest they should disturb that of their brother so lately stopped. I shall miss Harry Jones; who among us will not?

Mr. J. Ferguson Bell, M.Inst.C.E., President of the Institution of Gas Engineers.

By the unexpected death of Mr. H. E. Jones, M.Inst.C.E., M.Inst.Mech.E., the gas profession has lost one of its most striking personalities. His long and distinguished career as an eminent engineer, accomplished administrator, and wise adviser, won for him an outstanding position in the gas world. He was held in high esteem by those more immediately connected with him, and justly recognized as an authority on the science and practice of the gas industry, and especially executive control—being a Director of several well-known companies. To his discernment and wise guidance, the Commercial and Wandsworth Gas Companies owe much of their success.

It was the intention of the Institution of Gas Engineers, of which he was President in 1903, to recognize, at the annual meeting to be held in June, his conspicuous services extending over many years, by electing him an honorary member. Alas! this was not to be. Instead, death removed one on whom years appeared to sit lightly—the doyen of the gas profession—to the profound sorrow of his many friends, as was manifest by the large and representative gathering at High Ongar Church last Saturday, to pay their last tribute of respect.

Mr. H. E. Jones was never afraid to express forcibly his views; and the active interest in the work of the gas industry was maintained in full vigour until the day of his death. He passed peacefully away at the end of his 82nd year—honoured for his untiring work on behalf of the industry which he had so much at heart.

He recognized the importance of progress; and to stimulate the activities of members to contribute to the transactions of the Institution, he recently provided sufficient funds for the award annually of the London Gold Medal for the best paper presented dealing with some subject of technical interest, and which will in future be known as the "H. E. Jones, London Gold Medal."

He was first Chairman of the National Gas Council and for many years Chairman of the Gas Companies' Protection Association, and Justice of the Peace for the County of Essex for over 50 years. He will assuredly be greatly missed.

Condolences are assured to his two sons (who happily are following with much success the profession of which their father was an honoured member) and three daughters. A happy background to a long and eventful life was his ceaseless devotion and affectionate regard for his family, fortunately still a characteristic of most famous men.

The Ravine Seam of the Lancashire Coalfield.

The survey papers of the Fuel Research Board form a series of papers on matters connected with the physical and chemical survey of the coal seams of Great Britain. Report No. 4 (published by H.M. Stationery Office, Adastral House, Kingsway, W.C. 2, price 1s. 6d. net) describes laboratory experiments carried out by the Lancashire and Cheshire Coal Research Association on the Ravine seam of the Lancashire Coalfield, which is recognized over a large area, but has been worked only to a limited extent. The reasons for this are that the seam varies greatly in composition, and frequently becomes much split-up by dirt partings and bands of shale; also it shows marked tendencies to undergo spontaneous ignition in the goaf. It is a bituminous, caking coal, and is employed for gas-making, manufacturing, and household purposes. In certain areas, the ash and sulphur contents—especially the latter—are high for too easy utilization for gas manufacture. The composition and melting-point of the ash from different horizons in the seam may differ considerably. The ankerites in the Ravine seam undergo oxidation much more rapidly than is found to be the case in other seams examined. A series of tests showed that the coal could be greatly purified by washing. The fact that the seam is so variable in composition suggests that its utilization in the form of pulverized fuel may be of considerable importance.

ELECTRICITY SUPPLY MEMORANDA.

There seems to be some misconception on the part of at any rate the Hastings Corporation, if not other municipal authorities, as to the powers of the Electricity Commissioners to deal with national funds, or to make promises in regard to subsidies from them to maintain non-paying electricity schemes. Whatever the late Labour-Socialist Government may have committed themselves to in respect of subsidies has no binding effect upon the new Government. The present Government would not interfere with what their predecessors actually consummated, unless imperatively necessary in the national interests; but they cannot be bound to go farther with schemes in respect of subsidizing unless such commend themselves to them. Recently reference was made in the "Memoranda" to the fact that the Hastings Corporation were proposing to carry out a scheme of supply to outer villages and districts at a large cost. An estimate by the Electrical Engineer has shown that, if business develops in the outer areas as luxuriantly as he devoutly hopes it will, there will be a deficit of £1100 on the first year's working. The "if" is important. Electrical balance-sheet estimates often go astray—in the wrong direction; and we see nothing in the report of the Electrical Engineer in the way of a guarantee that the business he expects will be obtained, or that the calculated deficit will not be much more. It is all peculiarly vague; and it is on this that the Hastings ratepayers are asked through their councillors—be they wise or foolish—to shoulder a heavy expenditure. The ratepayers should look very closely into the matter. But there has been some attempt to placate any fears that may arise by telling them that any deficit will be made good out of the bountiful National Exchequer! In fact, in a note in a local paper, it was stated that there was a "definite understanding" that this would be so. Now does any sane man believe that the present Government would commit the taxpayers to an obligation to wipe-out all deficits that may arise, whatever their extent, in concerns over which the Government have no immediate administrative control? Mr. C. F. Botley, the Engineer and General Manager of the Hastings and St. Leonards Gas Company, wrote to the local paper pointing out that there could be no "definite understanding" of the kind, in view of the fact that the Government are still investigating the question, and have not yet determined upon any settled policy.

Electricity and National Money.

Mr. Botley is right; and we say this despite the assurance of the Town Clerk to the writer of the note in the local paper which gave publicity to the "definite understanding" hypothesis. A careful reading of what the Town Clerk had to say distinctly supports Mr. Botley's assertion. The Town Clerk is himself indefinite and vague on the subject. In the first place, he says it is not correct for Mr. Botley to say there can be no "definite understanding" as to any deficit. "There is," the Town Clerk adds, "a definite understanding between the Electricity Commissioners and the undertakers of electricity supplies in this country." The Town Clerk refers to a conference held last October, at which "it was stated that, with a view to the encouragement and development of electricity in rural areas, the Commissioners were prepared to make grants which would cover the loss of the undertakers on such rural schemes." The Electricity Commissioners have no power to vote the taxpayers' money away in this manner. They can only recommend. The Ministry of Transport and finally the Government stand between them and the parting with national money to make good deficits on the speculations of an industry run by local authorities and private enterprise. And October, 1924, is not March, 1925. We are rather surprised at the Town Clerk defending the "definite understanding" submission on such obviously shallow grounds. But he himself proceeds to show the insecurity of the "definite understanding" theory, and so supports Mr. Botley's contention that it cannot exist in a form to be "definite," or to have any reality, when he states that the new Government have been approached, and their reply was that their policy on the point has not yet been formulated. This being so, it would be interesting to have from the Town Clerk a positive interpretation of "definite understanding," and an indication of how it is he thinks the Electricity Commissioners have power to pledge the paying of money to liquidate losses on electricity speculation. If electricity, why not coal, gas, oil, water, and other things? There must be no preferential treatment by subsidizing any commodity (particularly a competitive one) in this country. We think that Hastings and its local officials should get from the present Government themselves a "definite" undertaking as to what they are prepared to do in the matter of wiping-off deficits on electricity speculation before making use of such a nebulous understanding as the one to which attention is here directed. We are strongly opposed to the subsidizing of indus-

The Indefinite Understanding.

tries by the Government; but if it is to be done in one industry, it should be applied to others.

Circulating Falsehood.

Give a lie a good start, and it is difficult to overtake it, unless those who do the circulation have sufficient good manners to acknowledge it when they know the truth. "Meteor" in the "Electrical Times" thinks he has found a nice tit-bit regarding the lighting of the offices of the Gas Department at the City Chambers of Glasgow; and he has been making energetic use of it. This is an example:

> Gas, says Mr. Goodenough, provides ventilation. That should be explained to the Glasgow Municipal Gas Department who complain so bitterly of bad air that a recommendation has been made to replace gas lights by electric throughout the municipal gas offices.

The best way to show how false is the statement that the Municipal Gas Department have "complained bitterly," and that it is through this a recommendation has been made to replace the gas lighting by electric lighting, is to give a history of the matter, which refers to the Surveyor's Section of the Department. Going back to the time when the section was housed on the first floor of the old City Chambers (up to June, 1923), the room was lit by electricity, and the ventilation provided (but not used) was similar to the system in the new City Chambers—*i.e.*, forced air currents actuated by fans in the turrets. The atmospheric conditions there (with electric light in use) were extremely unpleasant, arising from the smell of damp and drying clothing of men and stagnant air. The atmosphere was foul; and that was with electric light in use. In answer to appeals, information was given that it was impossible to use the fans provided because of complaints from the City Assessor that they caused a draught in his Department. Knowing that the Gas Department were to vacate the room within two years, the staff were asked to bear the conditions as best they could. In order to secure better arrangements in the new building, the architects were invited to pay particular attention to the matter. Assurance was given that the fans would be worked regularly, and that precautions had been taken to avoid inconvenience to the City Assessor's Department, which was to occupy rooms above the Gas Department in the new building as they did in the old one. For a considerable time after occupying the new premises, the fans were worked regularly, and the conditions were pleasant and in marked contrast to the old. Subsequently the fans were stopped; and there was again trouble. The result was that the General Manager of the Gas Department (Mr. John W. M'Lusky) wrote to the Town Clerk as to the inadequate ventilation of the survey room and the complaints counter in the Department. In his letter, he remarked: In the survey room from four o'clock onwards, there are upwards of 250 men employed, and the ventilation is most inadequate. We understand that this is on account of the fact that the fans are not in use, and we shall be glad if your Committee will give instructions that the fans be regularly in operation.

The Present Position.

The Municipal Buildings Committee remitted the matter to a Special Sub-Committee, to whom it was explained that the Gas Department had no complaint to make so long as the fans were running. But when 250 men came into the survey rooms (sometimes with wet clothing) the atmosphere became foul; and although the current of air provided by the heat from the gas lighting helped to some extent to clear the air, it was not designed to ventilate the room completely. The Sub-Committee subsequently recommended the removal of the gas-fittings in the Gas Department, and ignored the request that the means of ventilation provided at considerable cost should be used. The Department have submitted that, should this decision be ratified by the Corporation, it would not remove the cause for complaint, as it is not the products of gas combustion which are the cause (they naturally rise and find their way to the ducts provided at roof level), but it is the smell of the natural human excretions from lungs, skin, and clothing in a damp condition. Moreover, the Corporation, by ratification of such a proposal would give approval to the suggestion that gas lighting pollutes the atmosphere of buildings, which is entirely opposed to fact. It must also be remembered that quite 50 p.ct. of the business of the Glagow Corporation Gas Department depends upon gas lighting; and it would be damaging to have such a suggestion broadcast as the considered opinion and policy of the Corporation. The Department feel sure the Council will not deliberately be a party to such a suggestion. This history of the matter puts on it quite a different complexion from the one which "Meteor" of the "Electrical Times" has been so sedulously circulating.

EVENING STAR LODGE, No. 1719.

Installation Meeting.

The Installation Meeting of the Evening Star Lodge, No. 1719, was held in the Grand Temple of Freemasons' Hall on Wednesday last, the retiring W.M., W. Bro. Rae P. Normand, presiding at the commencement of the proceedings. There was an exceptionally numerous attendance of members and visiting brethren.

After the usual preliminary business had been transacted, the installation of W. Bro. Hermann L. Sheppard was carried out; W. Bro. Normand acting as Installing Master.

The installation of W. Bro. E. G. Smithard, P.M., P.P.G. Treas. (Norfolk), who had been duly elected as Treasurer, was deferred to a subsequent meeting on account of his absence through illness. The other officers were appointed and installed as follows:

W. Bro. Rae P. Normand	I.P.M.
Bro. Alfred H. Henry	S.W.
Bro. Fredk. G. Cockey	J.W.
W. Bro. H. W. Packham, P.M., P.P.G.D. (Surrey)	Chaplain.
W. Bro. Walter T. Dunn, P.M., L.R.	Secretary.
W. Bro. Frank West, P.M.	D.C.
W. Bro. A. L. Croager	S.D.
W. Bro. James W. Foreman	J.D.
Bro. John F. Simmance	Organist.
Bro. John A. Brentnall	I.G.
W. Bro. Reg. W. Foster, L.R.	Steward.
Bro. Albert B. Potterton	,,
Bro. Thomas F. C. Potterton	,,
W. Bro. R. H. Goddard	Tyler.

W. Bro. Thomas Cash, P.M., L.R., was elected an Honorary Member of the Lodge, on the nomination of the Standing Committee, in appreciation of his long and distinguished services to the Lodge and freemasonry generally. In returning thanks, W. Bro. Cash referred in feeling terms to several of the old members with whom he had been associated in the early days of the Lodge.

Bro. E. H. Swain, Engineer to the Metropolitan Gas Referees, was elected a Joining Member; and the following were proposed for initiation: Mr. Wilfred Baker Claridge, Engineer to the Marlborough Gas Company; Mr. James Waldron Swan, Assistant Manager and Secretary to the Hitchin Gas Company; and Mr. Leslie W. Dunn, Assistant Engineer on reconstruction of gas plant at the works of the Liverpool Gas Company.

At the dinner which followed, in the Connaught Rooms adjoining, W. Bro. Sheppard presided.

The toast of "The Worshipful Master," which was proposed in adequate terms by W. Bro. Normand, was responded to by W. Bro. Sheppard, who in turn submitted that of "The Installing Master," W. Bro. Normand.

W. Bro. Arthur Valon, P.M., L.R., gave the toast of "The Visiting Brethren" in an extremely interesting speech. It was responded to by W. Bro. James Bridge, W.M. of the Northern Star Lodge; W. Bro. Vale, S.W. of the Murdoch Lodge; W. Bro. John Ineson, of the Yarborough Lodge; and Bro. Leslie Rae.

The health of "The Past Masters and Officers of the Lodge" was appreciatively proposed by the W.M. W. Bro. Arthur E. Croager, P.M., replied for the former and Bro. Alfred H. Henry for the latter.

An excellent musical programme was provided, the numbers of which were interspersed with the toasts.

Emergency Meeting in June.

As in previous years, arrangements have been made by the Evening Star Lodge to enable those members of the Institution of Gas Engineers who are masons to meet some of their brethren in masonry in connection with the annual meeting of the Institution. The W.M. (W. Bro. Rae P. Normand), the M.E. (Bro. Hermann L. Sheppard), Wardens, and Brethren desire to invite all members of the Institution who are freemasons to attend. The Emergency Meeting for the purpose will take place on Monday, June 8, at 5.30 p.m., in the Grand Temple of Freemasons' Hall, Great Queen Street, W.C. After the Lodge, the brethren would be glad if their visitors would join them at dinner in the Grand Hall of the adjoining Connaught Rooms.

Cutting-off the Sunlight.—Executive heads of the American gas industry are, it is gathered from the "Intercolonial Gas Journal of Canada," waging warfare against the smoke nuisance. They say that an average person consumes about 6 lbs. of food and water a day. In addition to this, he takes into his lungs 32 lbs. of air each day. Vast sums of money are spent to insure unpolluted water and a pure food supply, it is argued, but up to this time little attention has been paid to a pure air supply. Yet every day we use 32 lbs. of air, against a total of 6 lbs. of food and water. The medical profession seems to be agreed that all pollution from soft coal smoke is responsible for many of the diseases they are trying to combat. The influence is both direct and indirect. Possibly the worst is the indirect effect of partially cutting-off the sunlight. This not only lowers the body's resistance, but has a depressing effect on an individual's outlook on life.

SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

ANNUAL GENERAL MEETING.

The Annual General Meeting of the Association was held on Tuesday of last week, at the Hotel Cecil, Strand, W.C., under the Presidency of Mr. Philip G. G. Moon, F.C.S. (Engineer and General Manager of the Bournemouth Gas and Water Company), who delivered his address. There were other items of interest on the agenda ; and previous to the meeting luncheon was served.

LUNCHEON.

The luncheon room was crowded, and those present included a number of distinguished guests. In addition to his Chairman (Mr. William Cash, F.C.A.), the President was supported by the following Directors of the Bournemouth Gas and Water Company: Sir Charles L. Morgan, C.B.E., M.Inst.C.E. (Deputy-Chairman), Sir Charles J. Jessel, Bart., and Lieut.-Col. Harold W. Woodall, C.I.E., M.Inst.C.E., together with the Secretary (Mr. Herbert A. Plumb, F.C.A.). There were also present the Vice-President of the Association (Mr. R. Robertson, of Bristol), the immediate Past-President (Mr. L. J. Langford, of Tunbridge Wells), Sir Arthur Duckham, Dr. T. Lewis Bailey (Chief Inspector of Alkali Works), and Mr. F. Napier Sutton. The Institution of Gas Engineers were represented by Mr. Walter Dunn, the British Commercial Gas Association by Mr. J. C. Walker, and the Gas Companies' Protection Association by Mr. F. E. Cooper. Mr. J. Ferguson Bell (the President of the Institution of Gas Engineers) was unfortunately unable to attend.

After the honouring of the Loyal Toast,

Mr. R. Robertson proposed "Our Visitors;" remarking that they were fortunate in having with them that day guests who had rendered, were rendering, and he hoped would long continue to render, excellent service to the community, and particularly to the gas industry. Looking through the list which the Hon. Secretary had handed to him, he saw chief among them Mr. William Cash and Sir Charles Morgan (Chairman and Deputy-Chairman respectively of the Bournemouth Gas and Water Company), and also Sir Charles Jessel and Lieut.-Col. Woodall, their co-Directors. Whether or not Bournemouth had adopted a standard of qualification for Directors, it was evident that they had ways and means of securing Directors of the very highest class. In Mr. Cash they had a gentleman who was regarded as one of the foremost gas administrators and financial experts. In addition to being a Past-President of the Institute of Chartered Accountants, he had a very wide business connection with the gas industry. Like all other busy men, he was the very one who was always ready to help others; and he had given ungrudgingly of his time and his vast knowledge and experience, for the benefit of the gas industry generally. They all looked upon him as one of their most valuable assets. The other Directors were also men of wide experience in business and professional affairs, and men possessing reputations that they all envied. Sir Charles Morgan was the immediate Past-President of that most exclusive and aristocratic body, the Institution of Civil Engineers. Lieut.-Col. Woodall was a very old friend of the Association, and they were delighted to see him present that day as an honoured guest. It fell to the lot of few men, as it had done to him, to secure distinction in both military and civil life—and to have a retort called after him. It was a privilege to be able to count him among their honorary members. Among the other guests, they had with them Dr. Lewis Bailey, the Chief Alkali Inspector. They were proud to have him as their guest, and to give him an opportunity of studying the gas manager in more congenial circumstances than was sometimes the case. There was also Mr. Walter Dunn, the kindly and respected Secretary of the parent Institution, and others he would like to mention, but the time was passing.

Mr. William Cash said that, though he felt his responsibility, it was a very great pleasure to be allowed to respond to the toast that had been so kindly proposed by the Vice-President. He would, in the first place, on behalf of himself, his co-Directors, and the other guests, like to thank the Association very much for having invited them to be there that day, and for the cordial reception of the toast. From what had been said, they would have gathered that, so far as the Directors of the Bournemouth Company were concerned, he was extremely fortunate in having with him a Board each member of which possessed special qualifications for administering such an undertaking. He would like to say how much the Directors appreciated the fact that the new President of the Association was their own Engineer, Mr. Moon. For Mr. Moon the Board felt the greatest admiration. They knew that the work he did for the Company was of the very highest character, and therefore that the Association had bestowed upon him a well-merited honour. As to the other guests, though sometimes the Chief Alkali Inspector might appear rather more of a "spectre" than an "inspector," he was very glad that Dr. Lewis Bailey had come along that day to meet gas engineers amid such pleasant surroundings. Then they had also with them Sir Arthur Duckham, who had had a very early association with Bournemouth. He had since gone a long way from it in many directions—especially in the work he did during the war, for which honour had been justly conferred upon him. He thought all company Chairmen would wish to express the debt they owed to the engineers and managers, who really carried on the work of the undertakings. From his own experience, he could bear testimony to the excellent service which these gentlemen rendered—to the advantage of the community and of the investors who put money into gas and water undertakings. Sometimes Boards called upon their officers to assist them, and at others they had to do, as Directors, what their officers told them to do. Sometimes "the boot was on the other leg," and Directors had to undertake duties which their officers ought to perform. That afternoon Mr. Moon really ought to have been at Westminster giving evidence which he was much more qualified to give than he (Mr. Cash) was.

AN INVITATION TO BOURNEMOUTH.

His association with the Bournemouth Company went back to 1891, when he was appointed Secretary. Subsequently he became a Director, and later on Chairman—a position which he greatly valued. He could therefore speak with some knowledge of the undertaking, which had developed tremendously under the management of Lieut.-Col. Woodall, and then of Mr. Moon. Of course, they were fortunate in supplying a town possessing such great advantages as Bournemouth could boast of; but even allowing for this, the increase in output of gas was remarkable. His reason for referring to this growth of business was that Mr. Moon was now engaged on the erection of a complete new gas-works of considerable capacity. The Company were spending something like £300,000; and following a practice of the Association in previous years, it was his pleasure to ask them to visit Bournemouth on some convenient date in May. The Company would be glad of an opportunity of showing them what was going on there, and more particularly what Mr. Moon was doing in the way of providing these new works. He extended to them a cordial invitation. [Applause.] Plans were also out for new showrooms and offices, though he did not think they would be erected by that time. The works, however, would be very well advanced, so as to reveal the plans Mr. Moon had drawn up and carried out—which reflected the greatest credit on him. They would see a works excellently well designed—not too ornamental, and at the same time not too obtrusively commercial—and largely built of reinforced concrete. If there was anything to be learned there, it would be at the disposal of the members.

POSITION OF ELECTRICITY.

Touching for a moment upon electricity, it would, of course, be known to them that they had been dealing at Westminster with the electricity supply of London, and it was interesting to note that the scheme put forward by the London County Council, and agreed to by the Electricity Companies, which had been the subject of discussion that week and in the preceding week before a Parliamentary Committee, brought into operation for the first time in the case of electricity the sliding-scale system with which they were so well acquainted in the gas world. A good deal had been seen in the Press on the subject of subsidizing electricity. So far as the gas industry was concerned, it did not ask for anything, provided it was treated on the same basis as its competitors. Sir Charles Morgan had handed him an extract from a speech by Mr. Woodhouse (the President of the Institution of Electrical Engineers), which put the position very fairly:

> "It would, in my view, be unsound to develop undertakings beyond the economic limit, either by penalizing existing consumers or by State aid, in that alternative services exist for most needs—*e.g.*, lighting by gas; power by self-contained plants, such as the petrol engine, the oil engine, and the steam turbine; heat by gas or coal; and so on."

If the gas industry was treated on these lines, there would be nothing to complain of.

The President thanked Mr. Cash on behalf of the Association for the invitation to visit Bournemouth, and for the kind remarks made concerning him (Mr. Moon). All he could say was that it would be a very poor engineer and general manager who could not be happy and make good under the admirable conditions existing at Bournemouth, and with such a Board of Directors as he had the honour to serve.

The Chief Alkali Inspector.

Dr. T. Lewis Bailey, proposing "The Southern Association of Gas Engineers and Managers," said that gas engineers and managers he knew pretty well, but he had no special name for them. For himself, he had been called all sorts of funny things, and now he was termed a "spectre." Now, spectres had peculiar properties, but they were properties which he was not aware that he possessed. [Laughter.] He had had dealings with gas engineers and managers in all parts of the country—with their President and with their Vice-President—and those dealings had always been of the most satisfactory kind; their relationships had invariably been of the pleasantest. The Alkali Inspectors, as Civil Servants, had never desired to be hard on gas managers, and he hoped never would desire to be hard on them. Whatever they had wanted to be done, had been done in exactly the spirit that they wished—not at all from the point of view of compulsion, but from the point of view of two people working together. One did not like to go about insisting upon points of law; it was far preferable to work from the point of common-sense. Consequently one was always quite willing to discuss—and even to go further than discuss—questions which were not mere points of law. Thus it did happen that in many directions gas managers had worked with his Department to a very considerable extent. The gas managers had done a great deal for his Department, and in return

the Department had tried to do something for them. ["Hear, hear."] The members of that Association, he knew, were not men who simply did a job as a job. They took their work from the right point of view—not doing their business mechanically, but from the highest motives, seeking to make improvement where improvement was possible. Consequently they were always up against all sorts of problems, which they tackled with excellent results. The gas industry of to-day was not the gas industry of even ten years ago; it was a new thing altogether. There was a time when he thought he knew something about gas making; then there came a time when he though, he knew nothing about it.

NEW METHODS ON OLD METHODS.

Perhaps he might be permitted for a moment to refer to the question of dealing with effluents from sulphate of ammonia plants. This was a very big subject. It was practically simple until they got into touch with some of the more modern works. Then he discovered that he had to go back and learn gas-making again; and during the past few years he had been endeavouring to learn something of the modern methods of manufacturing coal gas. He must confess that it had been quite profitable; but it had led him to one conclusion, and he hoped they would forgive him for saying it. It had led him to the conclusion that gas engineers had been going ahead as fast as they could on altered and improved methods of making gas; but he was rather inclined to think that they had stuck there. They had stuck their new methods of making gas on to their old methods of cleaning it; but was this right? It was a suggestion he threw out; and he thought he was right in doing so. Was there not a vast field to be explored in the cleaning of the gas—that was, in the treatment of the gas after it came from the retorts, and before it left the works? Trouble had been experienced in many works in regard to the disposal of the ammonia effluents; and those ammonia effluents at the present day were much worse than they used to be. The point to make was this: Was it better to make a dirty material and clean it; or was it better not to make a dirty material, and then not to have to clean it? He imagined from what he had seen of late that it was possible to make a cleaner liquor, and so prevent any troubles which some of them might be up against. He threw out this suggestion for what it might be worth.

THE ASSOCIATION'S JUBILEE YEAR.

The President, responding, first thanked Dr. Bailey for his remarks, and those present for the cordial way in which they had received the toast. If every Government Department functioned in the way that the Alkali Department did, it would be a much happier country than was the case at present. [Applause.] He was sorry to disagree with his Chairman, but probably he only referred to a "spectre" by way of a joke. At any rate, he could assure him that the inspectors were by no means spectres to those who had charge of gas-works. The Alkali Inspectors were always most helpful, and cordially co-operated with the gas engineers in any of their difficulties—assisting them to overcome those difficulties, and so, by mutual work, to fulfil the letter of the law, which, of course, must be obeyed. As an Association they had this year attained the honourable and dignified age of fifty years, so that it was their jubilee year; and he thought he could claim that every one of these years had been a year of growth and of ripening experience. They had seen the gas industry grow in importance until now it ranked as one of the great public services of the country, which had done much to improve the amenities of life. The widespread use of gas for cooking, heating, lighting, and power had improved out of all recognition the atmospheric conditions of the towns, and had eased the labours of hundreds of thousands of harassed and over-worked housewives. The Legislature had wisely, but perhaps too vigorously, restricted their profits up to the point that no possible charge of profiteering could be brought against the industry; and this, coupled with the economies resulting from the improved methods which such Associations as theirs fostered and encouraged, had led to their being able to offer a very cheap, and therefore very popular, commodity. All this had resulted in the success of the industry being based upon sure foundations; and he did not think it was an industry which, under present conditions, was likely to be easily overturned, in spite of insidious dangers. He could not help feeling that too many of the leaders of the country at the present time, under the hypnotic influence of that potent phrase "super-electricity schemes," were seeing pictures of a new heaven and a new earth which had no foundation in actual fact. Super-electricity schemes would perhaps improve the efficiency of the generating stations from its average of possibly 8 p.ct. now to the 20 p.ct. the optimists claimed; but while this was good in itself, and while electricity had an increasingly important part to play in the country's welfare and development, he did suggest that this increase in efficiency was not enough to warrant all the exaggerated claims that were put forward for it by the people who were promoting these super-electricity schemes, that they were going to revive the industries of the country and put them on a successful basis. At any rate, he thought a very important duty devolved upon every one of the members of the Association, and of the industry up and down the country, to put before the public generally the fundamental facts of electricity generation and gas production, so as to show clearly the relative importance of the two industries in the country's fuel balance-sheet, and that no State aid should be provided for electricity. He repeated that the Association had a definite duty to inform the public of the true facts of the matter. Then they had also another duty—to see that, so far as they were concerned, their own industry was brought up to the highest state of efficiency. They must, if possible, get more per ton from their gas-making operations, and save anything that at the moment might be going to waste, until no higher point could be attained.

THE BUSINESS MEETING.

An adjournment was then made to another room, where the business meeting was held, with Mr. Philip G. G. Moon in the chair.

CONFIRMATION OF MINUTES.

On the proposition of the President, the minutes of the last meeting, as published in the "Journal," were taken as read, and confirmed.

ANNUAL REPORT.

The report for 1924, as circulated among the members, was also taken as read and adopted, on the motion of the President, seconded by Mr. Samuel Glover.

The report included the following items:

The General Committee, in presenting their report for 1924, feel that the period under review has been one of considerable success and importance. The continued growth of the Association and the excellence of the various papers submitted is most gratifying.

The Committee deeply regret having to record the death of the following members: Mr. Henry Morley, Teignmouth; Mr. W. D. Hunter, Rotherhithe; Mr. A. F. Phillips, Westminster; Mr. S. Temblett, Andover; and Mr. C. F. Franks, South Metropolitan Gas Company.

The total number of members is now 304, as compared with 291 at the end of 1923.

The audited accounts show that the receipts during the year were £305 18s., while the expenditure amounted to £287 18s. 10½d.—a credit balance of £17 19s. 1½d. remaining. The total funds of the Association on Dec. 31, 1924, were £75 17s. 1d.

FIFTH ANNUAL REPORT OF THE COMMITTEE OF THE EASTERN DISTRICT.

During the 1924 session, eight monthly meetings were held in London and one county meeting at Guildford. The average attendance of members at the meetings held in London was 28, and at the county meeting 34. Two joint meetings with the members of the Western Section of the Association were held—at Tunbridge Wells in May, and at Portsmouth in October. In each case the attendance of members exceeded the average; and much useful information was gathered from the subsequent visits to the gas-works in both towns. On these occasions very generous hospitality was extended to the members, who are indebted to the President of the Association, Mr. L. J. Langford, and Mrs. Langford, and also to the Chairman and Directors of the Portsmouth Gas Company, for their kind entertainment, which was highly appreciated.

The reports on commercial topics continue to be of great interest to the members at the monthly meetings; and the information which is available on these occasions regarding the state of the bye-product markets indicates that the time devoted to the discussion of these matters is most usefully employed.

Papers of a high standard were presented by members on technical subjects, which embraced interesting features in the processes of manufacture and the distribution of gas. Among the papers were included the following: "Use of Steam in Purification," "Sulphate of Ammonia Propaganda," "Modernizing Gas Cookers," "Competition from Coke-Oven Coke," and "Meter Repairs." The fruitful discussion which followed the reading of these papers showed that the introduction and discussion of technical subjects at the monthly meetings are appreciated by the members and useful to the industry. The scope of the question-box has been enlarged in order to meet the desire of several members who contemplate alteration or additions to their works; and the information so supplied concerns the efficiency and working of gas manufacturing apparatus and plant. Two interesting subjects were introduced through this source during the year: "Remodelling a Carburetted Water Gas Plant," and "Installing New Vertical Retorts."

The circulation of copies of the transactions of the monthly meetings continues to be of great value to the members, and the demand for copies is increasing.

It is a source of great regret to the Committee that the monthly meetings are not more widely attended. Out of a total membership of 249 for the Eastern Section, the average attendance of 28 is not very encouraging for the officers of the Association, who are responsible for organizing the meetings; and the Committee trust that the members will endeavour to promote a larger attendance at meetings in the future.

The following District Officers were elected to serve during the coming year:

Chairman—Mr. F. Smallbone.
Vice-Chairman—Mr. J. Terrace.

Committee—Messrs. A. H. Andrews, C. Valon Bennett, W. H. Bennett, A. Caddick, T. Carmichael, C. Chambers, A. G. Cheal, S. Lacey, L. J. Langford, R. H. Ruthven, C. H. Rutter, A. W. Sumner, J. S. Thorman, and W. H. Warren.

Two members to represent the Eastern District on the General Committee, in place of those retiring by rotation—Messrs. A. H. Andrews and W. H. Bennett.

Hon. Secretary—L. Trewby.

The total membership of the Section is 249, of which 117 are representative members, and 132 ordinary members.

A. H. Andrews, *Chairman.*

FIFTH ANNUAL REPORT OF THE COMMITTEE OF THE WESTERN DISTRICT.

During the year eight meetings have been held, seven at Exeter and one at Exmouth. The attendance at the meetings has been fairly satisfactory, but slightly below the average for 1923.

Most of the matters relevant to the general trend of the gas industry have been discussed, and members have, to a great extent, benefited by such discussions. The future of the Association in the West is well assured, as we have almost a 100 p.ct. membership; and though some meetings have produced small attendances, others have proved of such interest as to merit the presence of thirty mem-

bers, which is very satisfactory considering the distance some have to travel.

The following members were elected as District Officers to serve during the coming year:

Chairman—Mr. C. G. Dawson.

Vice-Chairman—Mr. J. H. Cornish.

Committee—Messrs. J. Armstrong, S. E. Halliwell, H. Higham, P. S. Hoyte, J. Harger Pye, H. E. Riley, J. Taylor, W. P. Tervet, E. P. Vince, and J. Wesley Whimster.

Hon. Secretary—W. E. Dean.

Representative on the General Committee, in place of Mr. R. Robertson (appointed Vice-President)—Mr. W. E. Dean.

In regard to the year 1925, everything points to a renewed interest in the affairs of the Association; and it is hoped that the members will support the meetings as regularly as before.

S. E. Halliwell, *Chairman*.

Mr. W. H. Bennett Honoured.

Mr. L. J. Langford (Tunbridge Wells) said that, on behalf of the Association, he was entrusted with the pleasing duty of thanking Mr. W. H. Bennett, of Redhill, for his devoted and most valuable services to the Association during the time he had been their Hon. Secretary. This was a privilege of which he was extremely proud. His only claim to it, however, was that he happened to be the last of the five fortunate Presidents to occupy the chair during Mr. Bennett's term of office; and though he felt the present President (or any of his own predecessors) would have made these acknowledgments more gracefully, he was too utterly selfish to waive his own thin claim. Members fully appreciated that much of the progress of the Association had been dependent upon the energy, ability, and resource of the Hon. Secretaries; and they wished to do honour that day to one who had given of his very best for the past five years in this capacity. It was no sinecure for any man to undertake the office five years ago. At that time engineers had much leeway to make-up on their works and districts consequent upon the war; and, looking back, one might well have imagined that this would have adversely affected the Association's interests. But what did they find to-day? He knew they would agree with him that the period had been a very critical one, and that the Association's activities were never more lively. The membership during that time had increased from 241 to 304, or 26 p.ct.; and they heartily congratulated Mr. Bennett on the realization of his ambition in this important matter. He asked for the 300, and he got them; so that they saw their Association the largest of the Senior Associations—a fact of which they were justly proud. There was a wealth of truth in the old saying: "If you want a job done, and done well, get a busy man to do it." This had been amply demonstrated in the present case; and he sometimes thought their friend's spirit asked too much of his physical powers. They knew his activities were many, and his enthusiasm boundless for any matter in which he interested himself; and his indefatigable work for their Association in particular, together with his unfailing kindness and courtesy, would long be remembered by every one of them. Mr. Bennett's popularity was not confined to their Association, but extended to the sister Associations; for he had freely given of his time to visit those in the North, the East, the West, and the Midlands. They all desired not only to thank him, but to express their appreciation of his services in practical form. The letters he (Mr. Langford) had received in response to the circular issued on behalf of the Committee bore eloquent testimony to the esteem in which he was held by the members; and the proposal to elect him an honorary member of the Association, for which he had so successfully and unselfishly laboured, was heartily endorsed. He therefore had the greatest pleasure in moving that Mr. W. H. Bennett be elected an honorary member of the Association.

Mr. W. N. Westlake (Exeter) remarked that he had probably only one qualification for seconding this resolution—namely, that of representing to some extent the Western Section of the Association. It would be within the recollection of most of those present that Mr. Bennett took charge of the Association as Hon. Secretary a short time after it was reorganized, and it was just a question then as to whether or not the re-organization would be a failure; but with such an energetic Hon. Secretary as Mr. Bennett, he did not suppose one of them felt any real doubt on the matter. And they were justified in their faith, for success had come. It had enabled the Association to enlarge its usefulness to the industry, and much of this enlargement was due to the work Mr. Bennett had put into it. He would like especially to say how very much the Western Section appreciated the help he had given them. On many occasions he had taken the trouble and spared the time to journey down and attend the meetings.

The resolution having been passed with acclamation,

Mr. Langford said: Mr. Bennett, we are under a great debt of gratitude to you; and in thanking you most heartily for your devoted services to this Association, we ask you to accept honorary membership, and also these field glasses and cigarette case, which we trust you will find of service and will be to you mementoes of this occasion. They are small tokens, not only of our deep gratitude, but of our personal affection and esteem. May the future hold for you all you so richly deserve. May you live long and enjoy good health; and may the Southern Association have the advantages of your active support for many years to come.

[The cigarette case was gold, with a monogram in platinum.]

Mr. W. H. Bennett (Redhill) said he found difficulty in adequately thanking them for the great honour they had done him in making him an honorary member of the Association, and also for the valuable gifts. It was fortunate, perhaps, that he was not called upon to decide which appealed to him most; but he was sure they would not misunderstand him when he said that nothing they could give him would afford him so much pleasure as having bestowed upon him the freedom of the largest District Association. As they had heard, this was the jubilee year of the Association; and during these fifty years only some half-dozen of the members had been placed upon the Roll of Honour. Of these only three were on the list that day, and they were men who had done great service, not only to the Association, but to the industry as a whole. They could realize, therefore, how greatly he appreciated the honour that had been done him—particularly as he was the only one to receive this honour while still in active service. As to the handsome and useful gifts, no better choice could possibly have been made. He would always regard them as tangible proofs of the goodwill of the members; and when using them, as he hoped to do for many years to come, he would reflect on the many kindnesses he had received at their hands during the past five years. What he had done in this period had fallen far short of the ideals he had set before himself; and any success that had been attained was attributable to the encouragement and support received from the members. His thanks were due to his confidential clerk, Mr. Alfred Gear, who had done a lot of work, with entire satisfaction to him (Mr. Bennett) and the Association. Mr. Ernest Scears, the Engineer to the Company, had also on more than one occasion lent valuable help, for which he thanked him.

The Late Mr. A. F. Browne.

The President said that, as they were no doubt all aware, unfortunately since the last meeting they had lost one of their oldest and most esteemed members in Mr. A. F. Browne. Members would be glad to know that a wreath was sent on behalf of the Association, and that the Association were represented at the funeral by Mr. A. H. Andrews. He was sure those present would like to pay a tribute to the memory of their departed friend.

This the members did by standing silently in their places.

New Members.

The Hon. Secretary (Mr. H. C. Smith, of Tottenham) read the following list of names of new members, who were elected on the proposition of the President, seconded by Mr. R. Robertson (Bristol):

Mr. Frederick James Falkner, Manager and Secretary to the Romsey Gas and Coke Company, Ltd.

Mr. Henry Cecil Ratcliffe, Assistant Engineer and Chemist, Romsey Gas Company.

Mr. John Alfred Brentnall, Engineer to the Northfleet and Greenhithe Gas Company.

Mr. Douglas Forbes Irving, Engineer and Manager to the Leatherhead Gas Company.

Mr. Roy Forbes Irving, Works Superintendent, Poole, and Assistant Engineer to the Bournemouth Gas and Water Company.

Representative on the Institution Council.

Mr. P. S. Hoyte (Plymouth) proposed that the President be elected the representative of the Association on the Council of the Institution of Gas Engineers for the current year. Why had they waited, as an Association and as an industry, until now before electing a man occupying the position Mr. Moon did, with one of the most progressive undertakings of the country, to take his seat for the first time on the Institution Council? Probably the explanation was that Mr. Moon had not yet had the time to take that position in the affairs of the industry as a whole which they hoped in future he would find opportunity to occupy. The Bournemouth Gas and Water Company were developing at an extraordinary rate—almost unprecedented, he would say, for an undertaking of that size, in the history of the industry—and Mr. Moon's energies must have been absorbed by this development.

Mr. J. Wesley Whimster (Bath) seconded the resolution, which was agreed to.

Presentation to the Immediate Past-President.

The President said it was now his pleasant duty, on behalf of the members, to thank their immediate Past-President, Mr. Langford, for the excellent way in which he had conducted the affairs of the Association during the past year. It had been one of the most successful years in the history of the Association—due partly to the cheery good-fellowship of Mr. Langford, and partly to the quality of the programme he had provided for them. ["Hear, hear."] They all remembered, too, the

very pleasant visit they paid to his charming town and works, and the hospitality enjoyed at the hands of his Directors; and they had also in mind the additional visit paid to the Portsea Island Works—a visit which, thanks to the hospitality of the Directors and the excellent works that Mr. Carmichael had to show them, marked a red-letter day in the history of the Association. Mr. Langford had worthily upheld the high traditions of the office, and he had the privilege of presenting to him a suitably engraved silver salver as a memento of his year as President. [Applause.] They all felt that he heartily deserved it, and hoped it would serve to remind him of a very pleasant year of office.

Mr. Langford, returning thanks, said he was indeed grateful for the nice things that had been said about him. He could only tell them that he was inexpressibly proud to have occupied the presidential chair of the Association. Any success that had attended his efforts was due to the support so generously accorded him. He sincerely thanked the President, Committee, and members for this support—and especially those who came forward so willingly with papers. The salver so kindly presented to him would, as long as he lived, be one of his most cherished possessions, and bring back to him memories of a very happy year of office and of the host of friends he had made during that year.

Mr. Moon then proceeded to deliver his Presidential Address, which was in two parts. The second part was a description of the new gas-works of the Bournemouth Company at Pitwines, which the members will inspect later. [This description will be included in next week's issue.]

PRESIDENTIAL ADDRESS.

My first duty must be to thank the members of the Southern Association of Gas Engineers and Managers for the honour they have done me in electing me to the responsible position of their President for the ensuing year. The position has been filled by so many distinguished gas engineers in the past that the task of adequately upholding the dignity and traditions of the office is one which may well cause the average man much

THE PRESIDENT.

Mr. P. G. G. Moon, F.C.S., of Bournemouth.

anxious consideration. Fortunately for my peace of mind, I have great faith in the kindliness and the capacity for making allowances of the members of this Association; and so I am content to do my best and leave myself in their hands.

One of your former Presidents—I think it was Mr. Campbell—referred to the fact that most members regard a Presidential Address as a somewhat uninteresting proposition. I am inclined to agree—especially on this occasion—although in his own case Mr. Campbell proceeded to demolish his contention by giving an exceedingly interesting address. I think that the feeling—which undoubtedly exists—probably arises from the fact that no discussion of the subject-matter of the address is permissible. Subject to your approval, therefore, in order to overcome to some extent these objections, I propose to divide my remarks into two parts—one a short Presidential Address proper; the other a paper dealing with the new gas-works of the Bournemouth Gas and Water Company at Poole, which you will, I hope, see during your visit to Bournemouth. At the same time, I should like to voice my personal view that, even if it breaks an unwritten law, it would usually be a distinct advantage to the industry to open the subject-matter of all Presidential Addresses to discussion.

GAS SALES PROGRESS.

It must be a source of considerable satisfaction to every gas engineer to see the extraordinary progress that is being made in the sales of gas throughout the country. Even those of us who have most consistently sung the praises and possibilities of gas, must be surprised and gratified at the progress it is making. The shortage of household labour—the improvement in the design of gas apparatus—the increasing desire to mitigate the "smoke nuisance" in towns, coupled with the excellent work of the "B.C.G.A." in bringing the advantages of gas before the householders of the country in a dignified and convincing way, have all resulted in a wonderful wave of popularity for gas.

The figures for Bournemouth of the gas made and the consumption per consumer for the years 1904, 1914, and 1924 are given below:

Year.	Gas Made. Millions.	Gas Sold. Slots. Consumers.	Slots. Consumption.	Ordinary. Consumers.	Ordinary. Consumption.	Total. Consumers.	Total. Consumption.
1904	572·089	7,064	13,420	7,085	59,670	14,149	37,280
1914	1114·807	16,320	16,180	12,179	61,810	28,499	35,650
1924	1971·039	17,967	29,880	18,395	68,200	36,362	49,260

The satisfactory thing about these figures is the consistent increase in the consumption per consumer, as well as in the number of consumers. As some indication of the reasons for this steadily-increasing consumption, figures are given in the following table for the sales of gas apparatus in the Bournemouth area of supply for the past few years, as well as the summary of houses under construction during 1924.

Year.	Total Sales.	Cookers.	Fires.	Water Heaters.
	£			
1921	29,099	828	1570	243
1922	33,920	1150	2332	364
1923	42,956	1397	2944	523
1924	48,321	1743	3419	799

Summary of Houses Under Construction, 1924.

Number of Houses Started During Year.	Number Completed During Year.	Number Incomplete.	Piped Only.	Wired Only.	Pipe and Wired.	Houses Already Occupied.
1495	1196 (including 296 started in 1923)	595	593	1	602	1042
			1196			

	Cookers.	Lights.	Fires.	Boilers.
Points	1220	5196	2552	293

Bournemouth is, I know, a particularly favoured town, but figures of a similar character could no doubt be quoted by practically all our members. It is, I think, safe to claim that the "right atmosphere" has certainly been created throughout the country for increased gas sales; and given the necessary propaganda work on the part of an undertaking, an adequate response by the consumers is to-day fairly certain.

GAS, ELECTRICITY, AND POLITICS.

Much is read at every election, and in the election programmes of every party, of the wonderful results that are to accrue to the nation as the outcome of the super-electricity schemes put forward as planks in the various political platforms. Our brilliant, useful, but very extravagant (from a thermal efficiency point of view) younger brother receives all the attention; and in spite of an excellent Fuel Research Board, who can provide all the scientific facts for those who care to ask for them, none of the leading politicians seems to realize that the elder brother, gas, occupies a far more important place in the political economy of the country's fuel supply.

They appear to be quite unaware of the fact that, not only is the gas supply of the country very much larger, but it is also much more efficient from a thermal efficiency point of view, than the electrical supply. If they fully grasped the underlying thermal facts, they would realize that the greatest good to the nation would probably come by putting the two brothers into business together. Each fills an important place in the country's needs, and by working together the greatest efficiency of the dual operations would be most readily obtained.

Consider the figures for the electric supply undertakings for 1923 (the latest figures available at the time of writing):

Stations.	Fuel in Tons.	Units Generated. Millions.	Equivalent Therms. Millions. (Elec. Unit = 3412 B.Th.U.)	Average Coal Consumption per Unit. Lbs.	Lowest Coal Consumption per Unit. Lbs.	Highest Thermal Efficiency. P.Ct.
463	7,356,757	4955	169·4	3·32	1·70	17·7

Now contrast these with the yield from the same weight of gas coal carbonized in a modern gas-works:

Coal Carbonized. Tons.	Gas at 70 Therms per Ton. Mills. of Therms.	Coke at 10 Cwt. Made for Sale.	Tar at 10 Galls. per Ton. Gallons.	Sulphate at 20 Lbs. per Ton. Tons.
7,356,757	515	3,678,000 tons at cal. value of 12,000 B.Th.U. per lb., 989 million therms	73,000,000	65,685
	1504 million therms			

Comment as to the increased thermal yield is superfluous—the figures are sufficiently striking to speak for themselves. In addition, there is the splendid yield of tar and sulphate to put to the credit of the gas balance-sheet.

The average efficiency of the electric supply undertakings is just over 8 p.ct. The most optimistic claims of the super-station are in the region of 20 p.ct.; and if these claims could be realized throughout the country, the equivalent thermal output of electricity from the same tonnage of fuel would be 425 million therms. But gas on the same tonnage, under *present conditions,* gives 515 million therms—apart from the 989 million therms in the coke and immense quantities of valuable residuals! The coke from the above gas balance-sheet, if turned into producer gas and used for the generation of electricity, would generate 2747 million units of electricity. The moral is obvious!

For the purpose of comparison, it is interesting to note the figures for the Gas Light and Coke Company for the same year—1923:

Year.	Gas Sent Out in Million C.Ft.	Calorific Value.	Equivalent Total Therms per Annum in Millions.
1923	36,570	500 B.Th.U.	182·8

As Mr. Milne Watson has pointed out, that Company alone sent out a greater number of heat units than the heat equivalents of the electricity sent out by all the electricity undertakings of Great Britain in the same year. The gas sent out during 1923 by the gas industry as a whole was as follows:

Year.	Gas Sent Out in Million C.Ft.	Average Calorific Value, say	Equivalent Total Therms per Annum in Millions.
1923	259,849	475 B.Th.U.	1234

Coal used	16,460,632 tons.
Coke made for sale—	
Net	8,197,347 tons, approx.
Equal to	2,200 million therms.
Tar	181,962,574 gallons.
Sulphate of ammonia . . .	117,166 tons.

The electrical industry is, perhaps, not so efficiently organized for commercial sales operations as the gas industry. I do not think they have any organization doing nearly such effective work in such an excellent way as the British Commercial Gas Association; but they do appear to be able to get the political ear of the country in a far more definite way than does the gas industry.

Mr. Milne Watson in his remarks as Governor at the recent annual meeting of the Gas Light and Coke Company, Sir Dugald Clerk in his classic paper before the Society of Arts in 1919, Mr. Reginald Clarry in the House of Commons, Sir Arthur Duckham on many occasions, and Col. Woodall and Mr. Seabrook in their work on the combination of gas and electricity undertakings—have all in various ways drawn attention to the vital issues involved.

What is required, however, is a co-ordinated effort; and I think the time is over-ripe for the formation of a permanent Committee drawn from the leading administrators, engineers, scientists, and publicists of the industry, whose definite duty it should be to impress upon the country by means of lectures by eminent scientists, by newspaper articles and pamphlets, and by representations to all political parties, the fundamental thermal facts of gas manufacture and electricity generation, and their effect upon the nation's fuel resources.* I hope my remarks will not be interpreted as in any way belittling the great and growing importance of electricity and the part it plays in the home and industrial life of the nation.

Of the importance of electricity, and of the good that must come from a cheap and abundant supply, there can be no question. The important thing is to see that the thermal value of the coal which is the prime source of our nation's power is conserved to the uttermost, and that the thermal efficiency of every major operation of which it forms part is carefully investigated. From such a standpoint as this, not electricity, but the present methods of generating electricity, stand condemned.

Improved Methods and Research Work.

The preferential position occupied by gas suggested by my previous remarks must not lull us into a false sense of security. It should, on the contrary, imbue us with an increased sense of the industry's responsibility. The need for research work to the end that our methods may be improved was never greater than it is to-day. The problems that confront us are not those of the engineer and manager alone; they become more and more the direct concern of the physicist and chemist; and we should all do what we can to encourage research work on the small scale on our own works, and on the wider scale in those Universities, such as Leeds, which specialize in gas problems.

PURIFICATION.

The purification of gas, involving principally the removal of sulphur and ammonia, is, broadly, to-day what it was twenty years or more ago. We are still content to remove the sulphur by means of oxide of iron, sell the spent oxide to the acid maker, and buy back from him sulphuric acid to use in the manufacture of sulphate of ammonia. I say we are still content to do this—that, perhaps, is not quite correct. We do it because no alternative method is available. It is an expensive and wasteful business, enriching the railway companies and the acid manufacturers at the expense of our consumers.

Any research that will teach us how to utilize the sulphur in our gas by direct application, will benefit the gas industry greatly.

BURKHEISER PROCESS.

It is worth reminding members shortly of the work done in this direction before the war by Herr Burkheiser. In his process, which was working satisfactorily on a stream of ¾ million c.ft. of coal gas per day at the Tegel Works in Berlin, the crude gas, after the extraction of tar, and while still containing both sulphuretted hydrogen and ammonia, was passed through a series of comparatively small purifiers containing dried nodules of oxide of iron about the size of peas. The sulphur was extracted, and the gas containing ammonia was passed first through a wrought-iron saturator, and then through a vertical scrubber containing a solution of sulphur dioxide.

The sulphur dioxide solution came from another scrubber, through which passed the air and sulphur dioxide from the particular purifiers undergoing regeneration. The regeneration of the purifiers was conducted *in situ* in a stream of air at a controlled rate, which raised the temperature sufficiently to fire the freed sulphur and burn it to sulphur dioxide, but not so high as to dehydrate completely the oxide of iron. The critical temperature was found to be approximately 600° C. After regeneration the oxide was extremely active; and for the several months that the plant was working, no serious loss of activity was observed.

The absorbing liquor was circulated continually, first through the sulphur dioxide scrubber, where it became acid, then through the ammonia scrubber, where the ammonia predominated until it reached saturation point and crystals of ammonium sulphite—$(NH_4)_2SO_3$—were thrown down in the wrought-iron saturator placed between the two scrubbers. The ammonium sulphite oxidized upon exposure to the air to a stable salt composed approximately of two-thirds sulphate and one-third sulphite. This compound was richer in nitrogen than "straight" sulphate, and experiments proved it to be in all respects equal to sulphate in proportion to its nitrogen content.

This process was particularly attractive, in that it reduced the size of oxide purifiers to about one-twentieth of the ordinary size, utilized the sulphur direct, and did away with the need for expensive ammonia stills and lead saturators. Many tons of salt were made in Berlin, and some at Bournemouth, by this process. Chemically the process was without flaw, and the gas routine gave no trouble; yet it broke down principally on account of the difficulty of securing oxide nodules that would stand-up to the changes of temperature. They tended to break-down ultimately to dust, which gave excessive back-pressure, and led to irregular fouling and regeneration.

Many experiments were made without success to produce oxide impregnated materials that would permit the chemical process to take place, and yet not disintegrate under the heat. The process, however, was so promising that it really seems that further research is well worth while, and might lead to a more successful result.

CURPHEY'S PROCESS.

Another attempt to utilize the underlying principles of the Burkheiser process was made by Mr. Curphey (when Chief Alkali Inspector) and Mr. Linder. In a suitable furnace they burnt the sulphur in spent oxide fouled in the ordinary oxide purifiers, and passed the resultant sulphur dioxide through a scrubber. The acid liquor was used to absorb the ammonia from an ordinary sulphate still. After circulating a number of times, the concentration was sufficient to crystallize out ammonium sulphite crystals which oxidized to the two-thirds sulphate and one-third sulphite compound.

The chief difficulty with this process, as tried-out on an experimental scale for Mr. Curphey at Bournemouth, was to reduce the amount of water vapour coming forward with the

* Since writing the above, I understand that a small Committee of distinguished men has already been formed for this purpose. This is a matter for congratulation; and the work they have taken up needs all the loyal support and help that we can individually give.

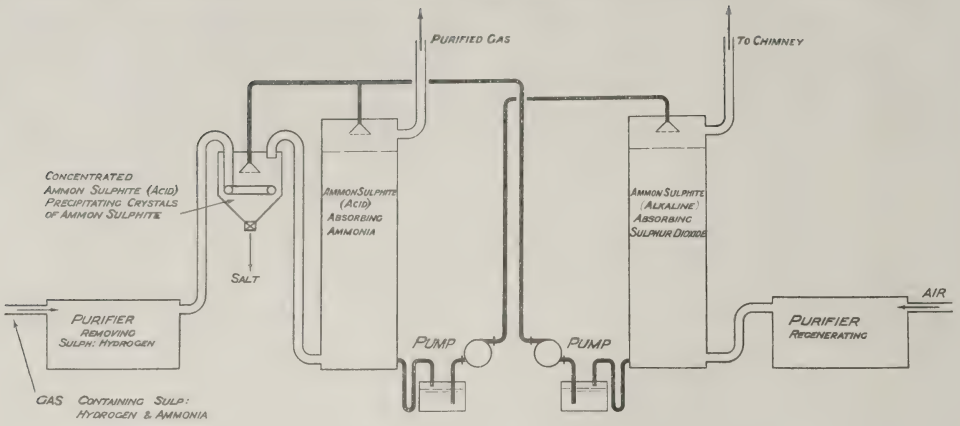


DIAGRAM OF BURKHEISER PROCESS.

ammonia to an extent sufficient to prevent undue dilution of the ammonium sulphite solution. Even if successful, this process was much less complete in its conception than the Burkheiser system, since it retained the existing oxide purifiers and sulphate still. It would nevertheless have utilized the sulphur direct on the gas-works without the intervention of the railway and the acid works—a quite useful advance on our present methods.

LIQUID PURIFICATION.

The liquid purification process developed by the Koppers Company in the United States of America, and licensed in this country to the Woodall-Duckham Companies, was a system which made possible the continuous purification of gas from sulphretted hydrogen by liquid reagents in closed vessels. It comprised two stages. In the first stage sulphuretted hydrogen was absorbed from the gas by means of an alkaline solution in a tower scrubber. In the second stage the solution was revivified in another tower scrubber by a current of air and the sulphuretted hydrogen liberated and discharged into the atmosphere, either direct in an extremely diluted form or by way of boiler furnaces in which the sulphuretted hydrogen was burnt to sulphur dioxide. The process could not be exploited in this country, since the Alkali Inspector very properly would not permit the sulphur removed from the gas to be discharged into the atmosphere either as sulphuretted hydrogen or sulphur dioxide.

Several large-scale plants operating on the above lines in the United States have experienced difficulty under certain atmospheric conditions; and in consequence the Koppers Company have been experimenting with the object of evolving a modified process to meet the difficulty. They have had considerable success, and hope to be able in the near future to have available on the above lines a process modified so that the sulphur will be recovered directly in a marketable form.

Generally, enough has been said, I think, to indicate the fruitful field that awaits the investigator in purification methods, and the desirability of stimulating research in this direction. In addition, there is still that other bugbear of the gas industry—or perhaps I should say of the gas consumer—which ought to be seriously tackled by every conscientious gas engineer. I refer to the organic sulphur compounds. Dr. Carpenter has evolved one process that satisfactorily removes them; but it is unfortunately a somewhat expensive and cumbersome one. Nevertheless, I feel strongly that until, either by this or by some other process, these sulphur compounds are removed from the gas, for so long will it fall short of being the perfectly satisfactory source of light and heat that it ought to be.

OIL CRACKING.

Another direction in which research work is desirable is that of investigating some means of increasing the efficiency of "oil cracking" in our water gas enrichment operations. The present method of spraying oil on to the red-hot brickwork of the carburettor has the merit of simplicity, but, unfortunately, labours under the disadvantage of low efficiency.

Ignoring the heat absorbed in the cracking operations, on the ground that it is largely waste heat, the thermal efficiency of the present method appears to be approximately as follows, with oil of calorific value of 18,000 B.Th.U.:

	P.Ct.
Gas enrichment	52
Oil tar, 15 p.ct. of oil used, cal. value 16,000 B.Th.U.	13
Loss	35
	100

When it is remembered that, even in a provincial company of the size of Bournemouth, the gas-oil bill is in the neighbourhood of £20,000 a year, it will be realized what an important financial bearing any considerable increase in oil cracking efficiency would have upon manufacturing costs.

NELSON PROCESS.

Some interesting tests were made at Bournemouth last year on a small experimental oil-cracking plant embodying the patented ideas of Mr. John Nelson. In this process gas oil is passed through a series of small vertical iron retorts, each containing a lead bath heated to a determined temperature, and with a certain amount of free space above the lead. The products of this process are oil gas, motor spirit, and carbon black of a particularly pure quality.

Two typical balance-sheets of the results obtained are given,

FIRST TEST.—*Maximum Motor Spirit Production.*

OIL PRODUCTS.

	Wt. Lbs.	Therms.		Wt. Lbs.	Therms.	P.Ct. of Total Therms.
34 galls., s.g. 0·86, cal. val. 18,000 B.Th.U. per lb.	290	52·3	Gas.—990 c.ft., s.g. 0·94, cal. val. 1500 B.Th.U.	72	14·8	28·3
			Motor spirit.—15·0 galls., s.g. 0·82, cal. val. 18,500 B.Th.U.	123	22·7	43·4
			Oil residue.—9 galls., s.g. 0·93, 16,000 B.Th.U. per lb.	84	13·4	25·6
			Carbon black.—Av. cal. val. 14,500 B.Th.U.	2	0·3	0·6
			Loss	9	1·1	2·1
	290	52·3		290	52·3	100·0

SECOND TEST.—*Maximum Gas Production.*

OIL PRODUCTS.

	Wt. Lbs.	Therms.		Wt. Lbs.	Therms.	P.Ct. of Total Therms.
30 galls., s.g. 0·86, cal. val. 1800 B.Th.U.	258	46·5	Gas.—2730 c.ft., s.g. 0·972, cal. val. 1250 B.Th.U.	177·7	29·65	63·80
			Motor spirit.—3·375 galls., s.g. 0·82, cal. val. 18,500 B.Th.U.	26·85	4·98	10·69
			Oil residue.—4 galls., s.g. 0·06, cal. val. 16,000 B.Th.U.	38·40	6·15	13·20
			Carbon black.—Cal. val. 14,500 B.Th.U.	4·24	0·62	1·33
			Loss	10·81	5·10	10·98
	258	46·5		258·0	46·50	100·00

one with the conditions arranged for maximum motor spirit production, and the other for maximum gas production. As so much waste heat is available in a water gas plant, no allowance has been made in either case for the heat used in cracking.

These results are interesting; and in the test for maximum gas production it is shown that an increase of over 10 p.ct. is obtained in the thermal value of the gas produced, as compared with present practice, as well as an increased supply of bye-products of a much more valuable character than the present rather troublesome oil tar.

The above increased thermal value of over 10 p.ct. is, of course, calculated on the total thermal value of the oil. From the gas manufacturers' point of view, the process improves the gas carburation from 52 p.ct. to 63 p.ct.—that is, 11 on 52, or 21 p.ct. increased efficiency compared with the existing system.

The chief drawback to the process—and it is largely one of policy—is that, in a works using (say) one million gallons of oil a year, the annual production of a motor spirit on the second balance-sheet would be in the neighbourhood of 30,000 gallons—and this could be largely increased at the expense of the oil gas by a regulation of the cracking heats as shown on the first balance-sheet.

The disposal of this motor spirit would obviously involve difficulties with the oil companies, who are themselves suppliers of motor spirit as well as gas oil. The way out of the difficulty would appear to be for the oil companies themselves to investigate and perfect such a process, and to standardize a plant designed to use waste heat that could be put down on a gas-works to the mutual advantage of both parties. The gas companies have the waste heat available for cracking the oil, and a use for the oil gas produced; while the oil companies need petrol for selling in the surrounding districts.

CARBONIZATION AND COAL.

Then there are the many problems awaiting solution in that complex process which is the basis of our operations—the carbonization of coal. We have the interesting researches of Dr. Lessing on the composition and impurities of coal and the possible effect upon the carbonizing process of the chemical composition and physical condition of the ash—the possible effect of largely freeing the coal from these impurities—the character and composition of the various constituents of coal proper and their reaction towards heat—all full of very real significance as to how they may affect the production from the coal of the maximum thermal yield in the form of gas.

We have the problems that surround the many attempts to deal satisfactorily with the complete carbonization of coal—problems which arise largely from the fact that the water gas reaction, which is the necessary concomitant of such a process, is endothermic. A liberal supply of comparatively pure oxygen at a sufficiently low price would solve the difficulty; but it is easier to point to the requirement than to satisfy the need.

These and many other problems that will readily occur to every listener await solution, and I suggest that the gas industry is big enough, and has enough to gain, to make it worth while, and ought to be enterprising enough to put-up a really large research fund that would enable these problems to be tackled in a much bigger way than the present restricted resources permit. Splendid work is being done now; but there is not enough of it, and that through no fault of the distinguished scientists who, at the present time, work in our interests.

COKE.

Coke is the residual which most affects the balance-sheet of any gas undertaking; but it does not always receive the attention that it deserves from those responsible. It is almost as important to push the sale of coke and to popularize its use as it is to push the sale of gas. We are passing through a period of considerable depression in the coke market; and it is eminently desirable that all gas undertakings should conduct a vigorous campaign in their own area—pointing out the advantages of the use of coke as a smokeless fuel—in their own interests, and in the interests of the industry generally.

CONCLUSION.

I have said nothing about such important questions as legislation, changes in statutory requirements, revision of standard price, wages, &c., because I felt that these are matters belonging properly to the National Gas Council and the Federation of Gas Employers; and there is already far too much overlapping and far too many meetings for the busy gas engineer to wish to waste time at a technical meeting in considering matters which are adequately dealt with by their appropriate associations.

This brings me to a subject which I suppose affects every member here to-day. That is the difficulty we all find in carrying out fully and energetically the increasing duties and responsibilities of our positions as gas engineers, and yet attending the many meetings of the various associations connected with our industry. There are the Institution meetings, the District Association meetings, the Commercial Sections, the National Gas Council, the British Commercial Gas Association, the Federation of Gas Employers, and many other special and incidental meetings—not to mention the committee meetings which some of us have to attend as well. They are full of interest, they all need our help and support; yet if we are to put our jobs first, as we should, we cannot possibly attend nearly all of them. It is a serious matter, and I have no sovereign remedy to suggest; but it calls for full consideration, and certainly for an understanding spirit on the part of the officials of any association when members fail to attend important meetings.

The only thing we can do at present is to avoid overlapping as much as possible. This is essentially a Technical Association; and, under present conditions, I think we should, as far as possible, try to confine ourselves to technical matters—leaving questions of policy, legislation, and wages to their appropriate bodies. Generally, I would say that there should be enough of interest and inspiration in the work of the present-day gas engineer to fill him with enthusiasm and a real love for his work. His problems are many-sided, his responsibilities are great; but his job is a live proposition, with a scientific justification for its existence, and with a fruitful promise of greater usefulness to come.

The Fuel Problem.

Sir Arthur Duckham said he had been privileged to propose a vote of thanks to their President, of whom they must be proud. In his excellent address he had dealt with subjects that were of vital and fundamental interest to the gas industry. The case he had made out for the gas industry was a wonderful one, and, in referring to it, he (the speaker) felt sure they would allow him to mention one point in the address. This had to do with the national programme for fuel development in this country from the gas point of view. He thought that they in the gas industry had lacked general propaganda, whereas they had very fine specialized propaganda; and he did not believe any of them had really formulated in their minds how a national programme of fuel development in the country should be put forward, especially from the gas point of view. A Committee were sitting on this subject, and he did hope they would come to really sound conclusions, because up to now the fuel problem had not been handled soundly in this country. It had been considered from one point of view, and he thought from a very narrow side of that one point of view. By education and propaganda, it seemed to him, this aspect could be very much widened. As to the part dealing with the works, the President had had a splendid opportunity and he had taken excellent advantage of it. Perhaps, however much they might envy him his opportunities, some of them would feel rather nervous as to taking his responsibilities. When they realized that the site of the works the President had been telling them of was formerly sea-covered; when they remembered the difficulties in connection with foundations—very grave difficulties indeed—and when they considered the whole lay-out of the works, he thought they would conclude that they knew of a place to which they could well take a friend who did not know anything of gas-works, but might be an engineer, and so able to appreciate what had been done. Mr. Moon had drawn on his own experience and the experience of others to a very full extent—especially in the wonderful handling arrangements he had installed on a very awkward site. When they visited Bournemouth and Poole—as he hoped they would all do—he was certain that the handling of the coal, coke, and ashes would interest them immensely. He had been privileged to see the works in the early stages, and to inspect the drawings; and the manner in which Mr. Moon had carried out the scheme proved him to be an engineer of very high standing. At the same time he had shown himself to be a chemist and physicist of no mean capability; and in dealing with the chemical problems of gas manufacture in the way he had done, he had overcome troubles that beset many gas engineers. He was glad to be able to say what he had, because he had been associated with Mr. Moon. Really the President was the man who started him on his travels from Bournemouth—a very nice place, with very nice people. But there was also another gentleman who must also be very proud of this address, and that was Mr. Thomas Glover, of Norwich, who must be delighted to feel that Mr. Moon, who had been with him at Norwich, should have done so splendidly as a chemist, as a chemical engineer, and as a gas engineer.

Modern Practice in Gas-Works.

Mr. W. Doig Gibb said that, in common with all the members assembled, he had listened with very great pleasure to Mr. Moon's address and to the description of the new works at Bournemouth. It was quite impossible in the time now at disposal to do more than touch the fringe of a discussion upon such works; and he suggested that at their next meeting, instead of having a formal paper, there should be a discussion on modern practice in gas-works. It would be most interesting and educative to deal with the new works in that way. He felt gratified to have been given an opportunity of seconding the vote of thanks, and of adding his personal congratulation to Mr. Moon. Many years ago he became acquainted with Mr. Moon, and had known him intimately since. Even in those early days he knew that Mr. Moon was a man who was to make good. He had certainly made good, and in making good had carried with him the respect of his brother gas engineers. He was a congenial companion, he was a well-read man, and from what he had been telling them he was evidently a good and sound engineer. [Applause.]

A Wonderful Proposition.

The President, returning thanks, remarked that it was somewhat embarrassing to hear all these things. He felt that, while he had done his best to deserve something, he had not deserved nearly all that had been said. It was gratifying to think the address had been regarded as not without interest. The gas industry at the present time was a wonderful proposition for people who were keen, and who wanted to make an impression on the problems that lay around them. He knew of no man who was more in love with his job than the average gas man one met. This became more and more marked every year. It was a splendid sign—a sign of a thoroughly sound industry; and it was a promise of future progress. There was little need for wonder that people should have love for their jobs when they got such magnificent receptions as the members had been good enough to give him. He did not know whether they would like to consider Mr. Gibb's proposal. It might be cutting-out a possible paper from another member; and the more papers they could get, the better it would be for the Association.

Mainlaying Methods at Pitwines.

Mr. A. W. Sumner (Grays) said he could understand that the mains must have been a source of anxiety. Not only was it a question of having to protect them from any corrosive matter, but there was the weight to consider. Had precautions been taken to support the mains in any way by raft, or in some other manner?

The President replied that naturally, as one could imagine on a site covered with several feet at least of clinker, and under that again several feet of mud, the question of mains gave considerable anxiety. Having regard, however, to the fact that they had already had a certain amount of experience on a different part of the same site with mains laid on this more or less floating reclamation material, they decided to take their courage in their hands and simply lay the mains in clinker, protected by clay, and with lime dressing from the waterworks softening plant so as to neutralize any acidity that might be set-up by the ashes. They judged from past experience it was pretty well a case of a floating raft. There was a certain slight movement, but no settlement at any one point sufficient to cause fracture of the mains.

The Address to be Discussed.

Mr. J. Terrace (Lower Sydenham) was sure it was the feeling of the meeting that they should have further opportunity of discussing so important a contribution; and he hoped the Committee would take into consideration the proposal put forward by Mr. Doig Gibb. The description of the works had been most interesting.

Mr. C. F. Botley (Hastings) associated himself with this expression. There were doubtless many points on which they would like further information. He congratulated the President on his excellent work.

Mr. Langford supported the proposal that Mr. Moon's contribution should be discussed at a future meeting, and it was unanimously agreed to.

Government and the Electrical Supply Industry.

The Hon. Secretary read a letter from the Manchester District Institution of Gas Engineers with reference to the proposals of the Government for financial assistance for the electricity supply industry, pointing out the necessity for protecting the interests of the gas industry and gas consumers.

After a short discussion, the following resolution was unanimously passed, on the proposition of Mr. Botley, seconded by the Hon. Secretary:

> "That while this Association learns with pleasure that a small Committee of distinguished men has been formed to consider the position of the gas industry in relation to the electrical industry and the suggested subsidy to the latter, it wishes to urge that this Committee should take the necessary steps to impress the position upon the country by means of lectures, newspaper articles, &c., and most particularly by putting the true economic facts with regard to both industries before Members of Parliament.
>
> "This Association further urges that the latter action be taken without any delay, as it feels that, while the gas industry has nothing to fear from the fair competition of the electrical industry, the booming of the latter for political purposes, if allowed to proceed any further without strong opposition, can only end disastrously for the country as a whole."

"B.C.G.A." SCOTTISH CONFERENCE.

A GOOD GATHERING AT GREENOCK.

Promoted by the British Commercial Gas Association, a successful conference, which made a direct appeal to those interested in the development of the gas industry in the urban centres of Scotland, was held in the Town Hall, Greenock, on Tuesday, March 24. The President for the day was Bailie Wm. Millar (the Convener of the Greenock Corporation Gas Committee); and he was supported by Mr. W. M. Mason (Manager of the "B.C.G.A."), Provost Brown (of Greenock), Mr. J. D. Keillor (Gas Engineer, Greenock), and Mr. J. W. Napier (Gas Engineer, Alloa.)

When the proceedings opened in the morning, upwards of seventy gentlemen, largely representative of gas interests in different parts of Scotland, were in attendance.

A Civic Welcome.

Provost Brown, at the outset of the proceedings, extended on behalf of the Corporation a hearty welcome to the members to the town of Greenock. He hoped and believed that they would have there an interesting and instructive conference. In his view, there was a great field for a cheap commercial gas, and conferences which had for their objective the furthering of this end were deserving of every possible encouragement.

The Presidential Address.

Bailie Millar, in the course of his address, said it gave him unbounded satisfaction to know that the Greenock Gas Department was sufficiently in the vanguard of the industry to merit such a visit. It was with pride the citizens and councillors of Greenock looked back to find that 98 years ago the people there were alive to the possibilities of gas as a heating and lighting agent; for in 1827 a scheme for the introduction of gas was considered and passed. Since then Greenock had never looked back. Year by year the output of gas had increased, and it was their joy locally that the undertaking had come to be regarded as one of the soundest financial concerns in the country. The book value of the undertaking was only £120,000, but the actual value was over £500,000. During the past decade alone, the output of gas had advanced from 410 million c.ft. per annum to 600 million c.ft.—an increase of approximately 45 p.ct. This certainly augured well for the future, and redounded to the credit of the Corporation as well as past and present Gas Managers. Such a wonderful record of valuable public service was surely deserving of special notice. It was a point worthy of note that in Greenock the increased use of gas coincided with the opening of a spacious showroom. There could be little doubt that the foresight of the Town Council in building and equipping such a fine showroom for the use and education of the ratepayers had been fully justified. It was an asset the commercial value of which it was impossible to estimate. Without such an opportunity of displaying the latest types of gas appliances, the public would never have benefited to the extent they had done. Over a hundred people visited the showroom daily to ask for advice on all matters relating to the use of gas. As a communal undertaking it was incumbent upon them to experiment with, and test, all new appliances before recommending them for public use. In this way the public interest was protected and consumers avoided having shoddy goods foisted upon them. The specialized knowledge and experience of the technical staff were also available for the asking; and, in his opinion, they were extremely fortunate in their choice of staff, the members of which were respected throughout the industry. He was advised by the Engineer that the maintenance staff of the public service department were accomplishing extraordinarily good work among all classes of consumers; and he was strongly of opinion that service of this kind was a boon and a blessing, not only to the consumer, but to the undertaking as well. The gas industry was represented last year at Wembley; and, as other undertakings, they in Greenock contributed their share to this enterprise. So convinced were they of the importance of such co-operative propaganda, that they were this year again contributing to the Empire Gas Exhibit, in the hope that they would enjoy even better results than last year.

Aims of the Association.

Mr. W. M. Mason, in the course of a statement regarding the work and policy of the Association, said that the three great obstacles to the widespread adoption of gaseous fuel were ignorance, prejudice, and competition. The first two of these were being gradually, but surely, overcome by good service, which included, as an absolute essential of modern successful business, persistent and consistent publicity. The task of the "B.C.G.A." was to ascertain all the facts about all the ways in which gas could best serve the community to its advantage, and then to make known these facts both to the industry and to the community it existed to serve. He specially appealed for

the fullest support of the gas exhibit at Wembley. It had been decided to continue the exhibit; and the fact that the Glasgow and Greenock Corporations were whole-heartedly joining the enterprise was a good and hopeful augury. They must keep gas prominently in the public eye, especially in these days when electricity was claiming to be a panacea for all ills. There must be co-operation on the part of the industry, and that could be manifested in no better way than by universal support of the Wembley Exhibit.

GAS SUPPLY AND COAL ECONOMY.

Mr. J. W. Napier, of Alloa, thereafter read a paper on "Gas Supply and Coal Economy," in the course of which he said it can be proved that the gas industry in its treatment of coal to produce, first a gaseous fuel, secondly coke as a solid fuel, and in addition the many bye-products, has advanced further than—and, indeed, is a long way ahead of—any other industry of to-day in the scientific treatment of coal. This fact must be insisted upon, and the public should realize what is undoubtedly true. Especially is this the case when it can be authoritatively stated that gas-works have during recent years made substantial further economies by improved processes of gas manufacture. It is undeniable that the high-efficiency operation of gas-works to-day, which has been reached by scientific research, has altered the whole question of fuel economy, and placed the matter upon a realized basis of practical success. It is not possible to conceive the displacement of the use of gas for domestic and industrial service by any other present-day form of heat energy.

Passing on, Mr. Napier expressed the opinion that, as a domestic fuel, coke has not gained the popularity it well deserves. To be satisfactory for household use, it should contain the minimum ash. In order to increase its use for domestic hot water supply, good quality coke should be supplied, clean, having little ash, and fairly free from water. Gas undertakings ought to cater more for this outlet of a smokeless fuel from gas-works, by supplying coke of good appearance and quality. By increasing the use of coke to the multitude of households, the gas industry will be contributing to coal economy and towards smokeless towns. It is to be regretted that quite a large proportion of coke produced in gas-works requires to be exported to other countries in order to find a market. This should not be so, as it is keenly felt by the gas industry that home industries and domestic uses should easily absorb the full quantity produced. It does appear as if more publicity is required in setting before the public the advantages of the use of coke.

It appears to him that the greatest asset provided by the distillation of coal in gas-works is the tar, which is the basic element of so many products necessary for a large number of processes in industry. Coal tar from gas-works and its products may be said to provide a national security for many industries, and to add enormously to the national activities in the employment of capital and labour. The internal resources of much of the wealth of this country will depend upon such factors as the distillation of coal in gas-works on scientific lines. The gas industry of Great Britain carbonizes about 17 million tons of coal per annum, producing approximately 170 million gallons of crude tar.

It is usually accepted that for intermittent use gas fires are economical. Let us examine the cost and conditions of use of gas and coal fires. With household coal of good quality at 40s. per ton, gas at 8d. per therm of 450 B.Th.U. (3s. per 1000 c.ft.), the heating costs are: Coal 1, gas 5. Correcting for efficiency with coal fires at about 30 p.ct. and gas fires about 60 p.ct., in order to produce an equal amount of heat gas will be 2½ times the cost of coal. Any mere financial comparison will unduly favour the coal fire. It is solid fuel *v.* gaseous fuel; and the latter is not dirty, has no ash to be removed, saves time, is a product of coal conservation, and does not foul the atmosphere. Suppliers of gas are able to put into the households of the country, in the form of heat, six times as large a proportion as electricity of the heat value that is in the coal which has been used to generate the gas or electricity. Electricity, even if the highest hopes of efficiency are realized, can supply only one-fourth the quantity of heat that gas is able to do.

It is desirable to put on record statistics proving the steady advance of the use of gas. From official returns, it is found that for the year 1912 the quantity of gas manufactured in Scotland was 17,301 million c.ft. During the succeeding period of twelve years ending 1924, the quantity had increased to 25,188 million c.ft. The increase is, therefore, 45½ p.ct. This increase has undoubtedly been largely obtained as the result of extended use for domestic cooking and heating, and also for industrial processes.

In discussing economy in the use of coal, it will be well to examine briefly what gas-works as industrial undertakings and large users of coal have succeeded in accomplishing. Steady progress in output of gas has been marked with progress in actually reducing, by means of new processes, the amount of coal needed to make the largely additional quantity of gas required. The actual saving of coal is remarkable. This has been brought about by two instruments, the vertical retort and the Gas Regulation Act. Before the use of vertical retorts, the quantity of gas obtained from each ton of coal was round about 10,000 c.ft. With the vertical retort, the quantity is not less than 15,000 c.ft.; and many works can show much higher yields.

A few examples will illustrate the importance and extent of the economy attained in the conservation of coal by gas-works. In the up-to-date gas-works, instead of, as formerly, 1000 tons of coal being consumed to produce a given quantity of gas, the improved retorts require only 666 tons. In the case of the Greenock Gas-Works, where the new system of retorts has been established for several years, the saving of coal per annum is not less than 21,000 tons, compared with the former process of gas making. Taking Scotland as a whole, as already stated, the increase in the quantity of gas produced is equal to 45½ p.ct. in twelve years. From a calculation, the remarkable estimate is obtained that to produce the gas required in 1924 actually less coal was used than in 1912. The figures are: Coal used for gas production in 1912, 1,730,000 tons; and in 1924 (with a 45½ p.ct. increase of gas required), 1,679,000 tons.

Discussion.

Mr. George Keillor (Greenock) said he was much in agreement with the paper. He was fully convinced that the general adoption of the process of gas manufacture was the only reasonable way of conserving the coal resources of the nation. Another aspect of the question which might be touched on was the importance of having a plentiful supply of the bye-products of gas-making—particularly tar and ammonia. He differed from Mr. Napier when the latter gave the efficiency of the coal fire at 30 p.ct. His opinion was that the figure ought to be 20 p.ct. Of course, he supposed they were all ready to concede that the efficiency of the old-fashioned kitchen range was very much less even than that—probably about one-half.

Mr. H. H. Gracie (Edinburgh) remarked that he was absolutely in sympathy with the views expounded by Mr. Napier in his paper. They were indebted to the author for bringing out the details he had done relative to the amount of coal now used in gas-making as compared with twelve years ago. It was important that the public should learn that 45 p.ct. more gas was now being manufactured in Scotland from a smaller quantity of coal than before. An argument of this nature showed the value of the industry in regard to the conservation of coal.

Mr. David Fulton (Helensburgh) said he did not subscribe to the opinion, sometimes too freely ventilated, that gas was "the real thing" now, and that it had no serious competitor or rival. He held that, while perhaps possibly the industry had done well in the past, it had still got to do much better, because the possibilities and potentialities of its competitors were enormous.

Mr. Mason remarked that, on the question of comparative efficiencies, he had that day been shown a most valuable statement applicable to Greenock. It was well that the statement should be published for the information of consumers, and perhaps Mr. Keillor would supply the particulars.

Mr. Keillor said that they heard so much about the difference in the costs of gas and electricity that in Greenock they had compiled some statistics for the use of the maintenance staff. The statement might be described as a comparison of cost for delivering equal amounts of useful heat for various purposes by gas and electricity. The data had been got together on the basis of gas with a calorific value of 410 B.Th.U. at 7d. per therm, and electricity at 1¾d. per Board of Trade unit.

Electric Radiator.—One pennyworth of electricity (crediting radiator with 100 p.ct. efficiency) will give out 2736 B.Th.U. of useful heat.

Gas Fire.—2736 B.Th.U. of useful heat (gas fire efficiency of 70 p.ct.) costs 0·28d.

Electric Geyser.—Five pennyworth of electricity (geyser efficiency 90 p.ct.) will give 15,390 B.Th.U. of useful heat.

Gas Geyser.—15,390 B.Th.U. of useful heat (geyser efficiency 80 p.ct.) costs 1·34d.

Electric Boiling Rings.—One pennyworth of electricity (boiling ring efficiency of 50 p.ct.) will give 1368 B.Th.U. of useful heat.

Gas Ring.—1368 B.Th.U. of useful heat (gas ring efficiency of 50 p.ct.) costs 0·192d.

The main facts emerging from the comparison were:

(1) Heating rooms by electricity requires the consumption of 4 times as much coal as the same service by gas.
(2) Geysers heated by electricity require the consumption of 5½ times as much coal as the same service by gas.
(3) Boiling water by electricity requires the consumption of 6¼ times as much coal as the same service by gas.
(4) Heating ovens by electricity requires the consumption of 3 times as much coal as the same service by gas.

Luncheon.

The delegates were entertained to luncheon in the saloon of the Town Hall; the hosts being the members of the Greenock Gas Committee. Bailie Millar again presided. The toast of "The Greenock Gas Department" was proposed by Bailie Hunter, of Perth, who paid a high tribute to Mr. Keillor, describing him as one of the foremost gas managers in Scotland. He remarked that the Perth gas undertaking had been put on the right lines by what a deputation learned on a visit to Greenock. Greenock had all along taken, and was still taking, a very prominent part in the development of the gas industry throughout Scotland. They must not forget that it was owing to the initiative and enterprise of Mr. Keillor and his Committee that Greenock was the first Corporation to adopt the Gas Regulation Act. A successful gas manager had to be a scientist, an engineer, and a chemist, besides being a good merchant, and these qualities were to be found in Mr. Keillor. The Chairman, in acknowledgment, said the flourish-

ing position in which the Greenock Gas Department found itself to-day was largely due to his predecessor ex-Bailie John Paterson. The toast of "The Press" was proposed by Mr. W. M. Mason.

ATMOSPHERIC POLLUTION REMEDY.

At the afternoon session papers were read by Mr. J. H. G. Whiteford, B.A., M.B., C.M., Medical Officer of Health, Greenock, on the subject of "Atmospheric Pollution in Relation to Health," and by Mr. George Keillor, on "The Contribution of the Gas Industry towards Reducing Atmospheric Pollution."

Dr. Whiteford said that anything which will prevent the free access of light must be prejudicial to proper and healthy development of the human being; and besides the effect of restricting the growth and development of the tissues, the absence of sunlight has a further vital influence on health—for sunlight has a most powerful destructive action on disease germs. Again, the appearance of the walls of an air cell in a section of a lung of a person living in the slums of an industrial area bears marked evidence of carbon deposit, which must have a strong relationship to the absence of perfect health, as well as to the great prevalence of tubercular disease of the lungs. On what other basis can one explain why the mortality rate from lung diseases, under one year of age, is 14 in the country districts of England, 15·5 in the country districts of Scotland, and 35 in the boroughs? The cost to a community in an industrial area for washing clothing, curtains, &c., as compared with the washing costs in a typical health resort with comparatively slight smoke, is greatly increased; and it has been calculated that this increase amounts to 7½d. weekly per household.

Mr. Keillor, in the course of his paper, said that if all coal at present consumed in the raw state were scientifically treated as in the process of gas making, it would provide:

1. Enough heavy oil for generating power to drive our naval and merchant ships—without importing a gallon.
2. —Enough smokeless fuel and gas to heat all our buildings and run our factories at a low cost, and without the production of smoke.
3. —Enough benzole for all our motor traction requirements.
4. —Sufficient sulphate of ammonia to fertilize the land, with a good surplus for export.
5. —An increased production of food, owing to ample and cheap fertilization of the land.
6. —Enough fuel oil and gas to ensure ample, cheap power.
7. —A clean and healthy atmosphere for our large towns.

There is an old Italian proverb which reads: "All diseases come in the dark and are cured in the sun." We are spending money in this country in vast amounts in enlarging our hospitals, our sanatoria, and our cemeteries, that should be spent in enlarging our gas-works.

At the present time the gas-works of the country produce about 9 million tons of coke annually, but this valuable smokeless fuel is too little used domestically. If gas-works coke was employed more freely for domestic heating, the price would be less liable to fluctuate; and as this is still the most valuable credit in the process of gas manufacture, its ready sale as a domestic fuel would be reflected in the price charged for gas. While the thermal efficiency of the best type of gas-heated boiler has now reached 75 p.ct., the running cost, if any considerable volume of water was required, would exceed that of the coke-heated boiler, and its use under those conditions would usually be confined to providing an auxiliary supply. All gas undertakings should therefore place the economy and advantages of the coke-fired boiler prominently before the public, and encourage its sale as far as possible.

For all rooms in occasional or intermittent use, gas fires are not only more convenient but cost less than coal fires; while for bedrooms they are invaluable. Taking the price of gas at 7½d. per therm (410 B.Th.U. gas) a modern gas fire with seven radiants consuming 4 c.ft. per radiant will cost slightly less than 1d. per hour. So that in Greenock, at all events, a gas fire burning continuously for five hours is cheaper than a coal fire.

The Housing Committee of the Greenock Corporation early recognized the advantages of gas in the home; and they are to be heartily congratulated upon their wisdom in providing each house with a gas cooker or a grill, a gas wash-boiler, and one or two gas fires, depending upon the size and location of the houses. All houses, however, independent of size or the ability of the householder to pay, are equipped with electric light; and we are giving away no secret when we say that many of the tenants would prefer to light their homes with gas.

The contribution of the local Gas Department and its customers towards the abatement of the smoke nuisance has been considerable. There are 17,849 gas consumers in Greenock; and among them there are on free loan no fewer than 16,326 cookers, hotplates, and rings. Of course, there are also a number of private appliances in use; and inclusive of the fires in the State-aided housing schemes, 668 gas fires have been fixed since March, 1924. Invaluable assistance has been given by the Master Plumbers and Gasfitters' Association in advancing the cause which we all have so much at heart.

The output of gas in Greenock will this year exceed 600 million c.ft., equal to 2,501,000 therms, compared with 418⅔ million c.ft. in 1913-14 (an increase of 43⅓ p.ct.); and it is estimated that 75 p.ct. of the total output is used for domestic purposes.

The price of gas in Greenock to ordinary meter consumers is 7½d. per therm, equal to 2s. 6¾d. per 1000 c.ft., compared with 2s. 6d. per 1000 c.ft. in 1913-14.

What we are doing in Greenock to dispel smoke from the chimney-tops is just what every gas undertaking in the country is doing; and our united endeavours are already influencing the state of the atmosphere. Fogs are now fewer; sunshine has increased; and the death-rate from diseases affected by smoke has fallen. But there are still some 35 million tons of coal used raw each year for domestic consumption alone; and until this economic and hygienic folly ceases, the toll which smoke takes of life and health will of necessity go on.

Discussion.

Ex-Bailie Lemmon (Greenock) said the Smoke Abatement Committee of the Greenock Corporation had in bygone years been subjected to a good deal of ridicule because of their supposed inaction. His own view was that on this question of atmospheric pollution by smoke there ought to be set-up throughout the whole country something in the nature of a time limit. If at the end of the period fixed there had not been a general abatement of the nuisance, the offenders ought to be called upon to face the consequences. Everybody knew that the countryside would be the better without black smoke; and it did seem to him that the people who created the nuisance should do their best to find a remedy for it.

Bailie Isabelle Kerr wished that more women had been among the audience to hear what had been said. Speaking as a woman, she personally deprecated the great wastage that had gone on for so many years in the use of coal for domestic purposes in kitchen ranges. It was dreadful to reflect that so much work, energy, time, and money should be expended, when the food could be as easily and much more economically prepared by using gas cookers. If every man and woman, and the proprietors of large works, would concentrate on facing the problem of smoke abatement, it would soon be solved.

Mr. Whysall (Electrical Engineer, Greenock) said that, in his opinion, electricity was one of the best preventives for atmospheric pollution. Anyone who was at all observant in his journeyings through the industrial parts of the town was bound to note the great change that had taken place. Speaking as an individual, he was absolutely at one with Mr. Keillor in what he maintained for the Gas Department. He favoured legislation in smoke abatement, but prophesied that it would take twenty years to come to pass. He would like to see such good progress made by electricity that the gas engineers would have to look still better after their consumers in regard to the needs of domestic life.

Bailie Hunter (Perth) said he had been delighted to hear the observations of Bailie Isabelle Kerr, and felt he must congratulate the people of Greenock upon having a lady of her outstanding talent and ability in the Town Council. Experience was showing that the owners of factories were realizing more and more that it did not pay them to send great quantities of smoke into the atmosphere. The same knowledge, unfortunately, was not so prevalent among housewives. He had been impressed by one suggestion put forward by Mr. Keillor, which was that coke should be sold in small quantities. In Perth they had tried to encourage the sale of coke among the poorer people, and had been fairly successful in creating a healthy demand in this way.

Ex-Bailie Paterson (Greenock), speaking as an old Convener of the Gas Committee, said he was bound to confess that the Greenock Corporation, during his régime, had been most generous. It seemed to him that they had been pioneers of smoke abatement in Greenock.

Mr. James Bell (Dumbarton) remarked that, in spite of the inefficient and ineffective legislation relative to smoke abatement, improvements had been going on in this direction. Such improvement as had been noted was due to the wise policy adopted by the gas industry generally, in pushing the use of gas appliances. He had the feeling, however, that they would look in vain—at least for many years to come—for any legislation which was going to do away entirely with the evil of atmospheric pollution; and this being the situation, it behoved all interested in this pressing problem to do the best they possibly could to extend the use of gas.

Mr. Gavin M'Arthur (Cleansing Superintendent Greenock) said that, though he was not in any way connected with the gas industry, he felt bound to admit that Mr. Keillor had put forward a strong and convincing case for the greater use of gas. He put in a special plea for the general home combustion of domestic refuse. In attaining this end, he believed the gas industry was capable of proving a helpful ally.

The proceedings terminated with the usual votes of thanks—proposed by Mr. Mason.

Dr. Saleeby's Lecture.

In the Watt Hall, during the evening, Dr. C. W. Saleeby delivered his suggestive and reasoned lecture on the smoke peril and its effect on national life.

A Kent Invitation.—The Secretary of the Kent Section of the Southern District Salesmen's Circle informs us that the concluding meeting of the session will be held at Tunbridge Wells, at 3 o'clock, on Thursday, the 23rd inst., and that the members would heartily welcome the presence of some of the senior officers in the district.

MICHELL CRANKLESS GAS ENGINE AND COMPRESSOR.

Most gas undertakings in the course of their development are confronted from time to time with the difficulty that trunk mains which were laid down years ago are not of sufficient capacity at the usual low pressures available to cope with the continual growth of the cities and the ever-increasing demand for gas, particularly at the times of peak loads. To meet these conditions, the use of "boosting" or compressing plant is resorted to, in order to avoid the high cost of replacement of, or extensive addition to, the trunk mains. In the general acceptance of the term, the function of the boosting plant is to increase the pressure in the mains available from the holder, by taking the gas at the holder pressure and passing it onward at an increased pressure of several inches water-gauge direct into the low-pressure mains. The function of the compressor is to take the gas at the pressure as delivered from the holder, and drive it forward at an increased pressure of several pounds per square inch through independent high-pressure mains for delivery either into a holder in the district, far removed from the manufacturing station, or for discharge, through suitable governors, into the low-pressure reticulation some distance from the works. Machines for either of the above purposes must be reliable and efficient in operation, and must operate satisfactorily within a wide range of delivery. The driving force for the plant should preferably be derived from the gas available in the mains; as by this means the use of an outside power service is avoided, particularly in the case where the plant is placed at a point away from the gas-works.

Machines of various types have been employed as boosters, but, the volumes of gas being large and the pressures to be generated comparatively low, they have hitherto in most instances been either of the centrifugal fan class, or of one of what are known as the "positive rotary" types of blower machines embodying rotating blades or impellers. The pressure requirements of the plant may vary from a few inches water-gauge in the former case to (say) five or ten pounds per square inch in the latter case; the tendency being to increase the pressure considerably above these figures. For high pressures, the use of reciprocating machines of the familiar piston-cylinder class is often resorted to. The plant which is the subject of this article is of this type, but it will be seen that in the particular design developed it is capable of handling large volumes of gas at comparatively low, as well as at higher, pressures in a very efficient manner.

We illustrate (fig. 1) a new type gas booster unit of the latter class, constructed by Messrs. Crankless Engines, Ltd., of Melbourne. This unit consists (as can be seen) of two machines arranged on a common bedplate, and directly coupled together by a clutch coupling. The booster is the right-hand member of the unit, and comprises eight double-acting cylinders each of $9\frac{3}{8}$ in. diameter and $8\frac{1}{2}$ in. stroke. The cylinders are arranged in four pairs around the axis. The two pistons of each pair are connected by a central "yoke," carrying the articulated slippers by which the double piston is actuated from the driving slant, according to the Michell crankless construction. The slant, which is keyed to the shaft of the machine, revolves at 750 r.p.m.; the rated output of the booster being 200,000 c.ft. per hour, delivered against a pressure equal to 60 in. of water. The delivery main for the gas is 18 in. in diameter, and is seen in dotted line emerging from the bedplate beneath the booster.

The characteristic of this type of machine which especially commends it as a low-pressure blower is its high volumetric capacity relatively to its bulk. High volumetric capacity is commonly regarded as the special attribute of turbine machinery, but reciprocating blowers of the crankless type can easily be designed to deliver greater volumes of compressed air or gas than turbine blowers of equal dimensions and much higher rotary speed. The booster illustrated discharges at full load a volume of gas approximately equal to 130 times its own total bulk per minute. It is at the same time as well balanced dynamically as a turbine, and is more efficient as a compressor, especially under varying loads, than a turbo-machine. Its volumetric efficiency, determined both from indicator diagrams and by orifice and pitot-tube measurements, is 96 p.ct.

The intake of gas to the booster is controlled by rotary valves, which are directly driven by the shaft, but rotate on independent ball-bearings. The delivery valves are light automatic spring valves; the machine being thus adapted to work efficiently with varying delivery pressures, as it is usually required to do in practice.

The booster is driven by the machine which forms the left hand member of the unit as illustrated; this being a Michell crankless gas engine having eight cylinders arranged in much the same way as the cylinders of the booster, but in this case single-acting. The cylinders are of $4\frac{3}{4}$ in. bore and $5\frac{3}{8}$ in. stroke; the rated power of the engine being 50 H.P. at 750 r.p.m. when supplied with gas of 500 B.Th.U. (net) per c.ft.

The valve-shafts of the engine drive two oil pumps located in the box-shaped bedplate that is to be seen; this bedplate serving also to contain the tank and filter for the lubricating oil, and comprising intake and delivery chambers for the gas pumped by the booster. Each pump, one of which serves for the lubrication of the engine and the other for the booster, supplies eight distinct points with oil, each being a small Michell crankless pump with eight single-acting plungers. To be seen beneath the engine is a system of switch-valves by means of which the pressure at which the oil is delivered to any one of the lubricating points can be read on one or other of two pressure gauges. Ignition is effected by high-tension

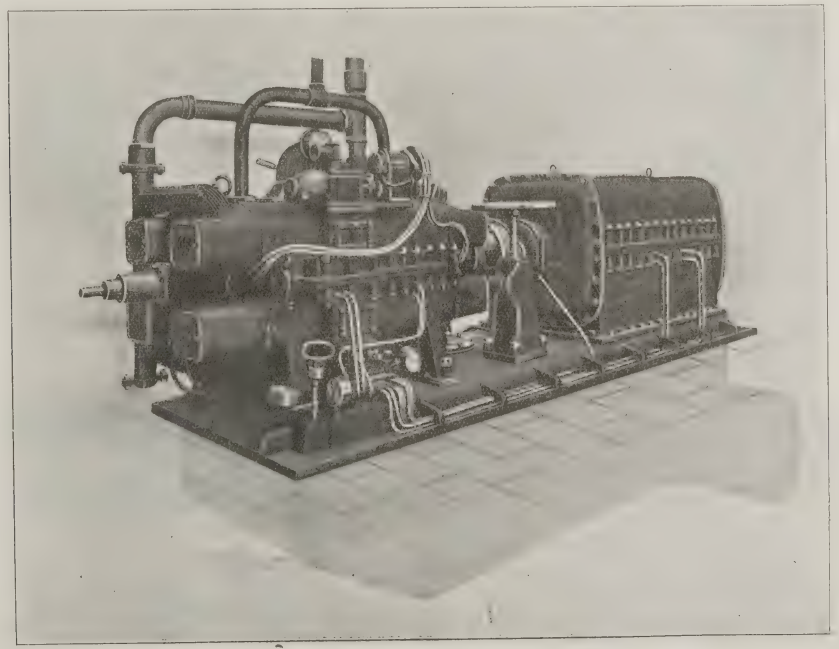


FIG. 1.—THE MICHELL CRANKLESS GAS BOOSTER.

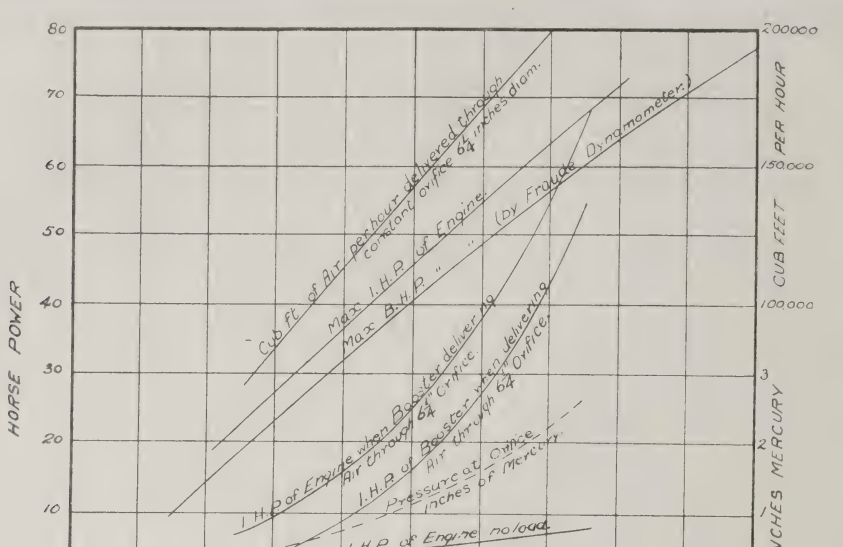

HORSE POWER
CUB FEET PER HOUR
INCHES MERCURY
SPEED. REVS PER MINUTE.
Cub. Ft. of Air per hour delivered through constant orifice 64 inches diam.
Max. I.H.P. of Engine
(by Froude Dynamometer)
Max B.H.P. "
I.H.P. or Froude when Booster delivering Air through 64 Orifice
I.H.P. of Booster when delivering Air through 64 Orifice
Pressure at Orifice inches of Mercury
I.H.P. of Engine no load

FIG. 2.—DIAGRAM OF CHARACTERISTICS OF COMPRESSOR AND GAS ENGINE.

magneto; a special starting magneto being fitted to provide an effective spark when the engine is turned over slowly by hand, as can easily be done by one man. This high-speed compressor, however, lends itself equally well to direct electric drive or high-speed steam engine or turbine, in cases where electric or steam drive is more desirable.

The plant described and illustrated in the present article is the second of two similar units which have been supplied to the Australian Gaslight Company. Before dispatch from the works of the makers, Messrs. Crankless Engines, Ltd., of Melbourne (whose London Office is at Aldwych House, W.C.), each unit was submitted to thorough tests. It will be readily understood that, as the flow of gas in a "boosted" main is entirely dependent on the continuity of action of the booster, the non-stop capabilities and durability of the latter are its most important features in the eyes of the gas engineer.

The principal results of the tests referred to are given in diagram form in fig. 2. In these tests the booster delivered not coal gas, but air supplied to the intake at mean atmospheric pressure and temperature of approximately 29·8 in. Hg. and 60° Fahr. respectively. Under this condition the frictional resistance in the valves and other passages of the booster was, of course, much greater than when pumping coal gas. The diagram of fig. 2 shows, in addition to the results of the tests of the complete unit, indicator and brake tests of the engine running uncoupled, and also coupled to a Froude hydraulic dynamometer. The various tests agreed in showing that the mechanical efficiencies of the engine and booster are each approximately 87 p.ct. over a considerable range of load; the volumetric efficiency of the booster being not less than 96 p.ct. at all loads up to the maximum. The gas consumption of the engine was slightly more than 0·5 p.ct. of the volume of air pumped. When pumping gas at the same pressure, the corresponding consumption would be appreciably below 0·5 p.ct.

A point of much interest in this particular design of plant is that it can operate efficiently within a wide range of delivering capacity simply by variation of the speed of the engine.

In the apparatus referred to, the control is by hand, but the plant could be suitably controlled by automatic means; the speed of the engine and compressor being varied to maintain a constant pressure in the delivering main. Owing to the number of pistons in operation, and the frequency of their movements, pulsation in the delivery pressure is almost eliminated. The two machines installed in Sydney are working satisfactorily; and a repeat order comprising three similar machines is now being executed. In addition, a machine with a capacity of 150,000 c.ft. per hour at a pressure of 5 lbs. per sq. in. is being manufactured for the South Australian Gas Company, of Adelaide.

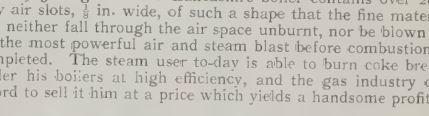
The inventor of the crankless engine—Mr. A. G. M. Michell—will be immediately recognized by many of our readers as the inventor of the world-famed thrust bearing, which has made possible the construction of the large battleships (of which H.M.S. "Hood" is an example), and which is now incorporated in all modern ships whether for the Royal Navy or for the Merchant Services. It should be added that the crankless principle is applicable to engines of all classes, and is regarded by many of the highest authorities as an invention which will revolutionize engine construction within the next few years. The sole rights for the manufacture of the crankless gas compressor in Great Britain have been secured by Messrs. George Waller & Son, Ltd., of Stroud.

COKE BREEZE FOR STEAM GENERATION.

Tests on the "Turbine" Furnace.

The adoption of improved methods in the gas process from the point of view of over-all thermal efficiency will have the effect of releasing more and more coke breeze for sale. This is particularly the case when steam is generated by waste heat. At the same time much more efficient apparatus for burning coke breeze under gas-works boilers is now available.

In this connection the "Turbine" forced-draught steam-jet furnace is of particular value, being specially adapted for burning coke breeze and dust. The general design of the furnace is already familiar; and it will be remembered that an ordinary 6 ft. by 3 ft. grate for a Lancashire boiler contains over 2000 tiny air slots, $\frac{3}{8}$ in. wide, of such a shape that the fine material can neither fall through the air space unburnt, nor be blown off by the most powerful air and steam blast before combustion is completed. The steam user to-day is able to burn coke breeze under his boilers at high efficiency, and the gas industry can afford to sell it him at a price which yields a handsome profit.



Sectional Elevation of "Turbine" Furnace.

It is the object of this article to give some authentic figures as to the results being obtained with the "Turbine" furnace using coke breeze only; though in a general way the ordinary steam user is well satisfied with a mixture of coke breeze and coal, which gives no more trouble than does coal alone.

The first typical test, which lasted eight hours, is that carried

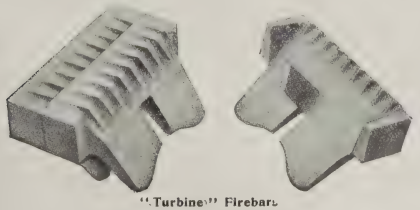
out some time ago at the Beckton Works of the Gas Light and Coke Company, using a "Lancashire" boiler 30 ft. by 8 ft.:

FUEL—	
Coke breeze, 60 p.ct. under ½ in.	
Total consumed	8400 lbs.
Average per hour	1050 lbs.
Average per sq. ft. grate area per hour	38·2 lbs.
ASH—	
Total	14 cwt.
P.ct.	18·7
WATER—	
Total evaporated	4000 gallons.
Average per hour	500 gallons.
AVERAGES—	
Feed temperature	53° Fahr.
Pressure	66 lbs. per sq. in.
Jet pressure	60 ,, ,, ,, ,,
RESULTS—	
Lbs. water per lb. fuel as fired	4·77
,, ,, ,, ,, ,, from and at 212° F.	5·7
FLUE GASES—	
L.H. side, CO_2 = 17·4 p.ct., O_2 = 2·9 p.ct., CO = 0·6 p.ct.	
R.H. side, ,, = 16·7 ,, ,, = 3·5 ,, ,, = 0·5 ,,	
Average, ,, = 17·0 ,, ,, = 3·2 ,, ,, = 0·55 ,,	

The second test was at the Tinsley Park Collieries, Ltd., of Sheffield, using metallurgical coke breeze dust:

NAME OF SAMPLE	"Coke Ash"
ANALYSIS OF FUEL as Received—	P.Ct.
Volatile matter	12·32
Ash	21·92
Fixed carbon	52·22
Free moisture	12·01
Hygroscopic moisture	1·53
Calorific value	9381 B.Th.U.
BOILER—	
30 ft. by 8 ft. 6 in. "Lancashire" and economizer. Fitted with "Turbine" furnace, 33 sq. ft. grate. Evaporation guaranteed 700 gallons per hour. Duration of test, 5 hours.	
FUEL—	
Total consumed	9550 lbs.
Average per hour	1910 ,,
Average per hour per sq. ft. grate	58 ,,
WATER—	
Total evaporated corrected to 60° Fahr.	4223 gallons
Average per hour corrected to 60° Fahr.	845 ,,
AVERAGES—	
Steam pressure, gauge	101·5 lbs.
Jet pressure	90 ,,
Feed temperature	227° Fahr.
RESULTS—	
Lbs. water per lb. fuel as fired	4·42
Lbs. water per lb. fuel from and at 212° Fahr.	4·55

Obviously, therefore, if coke breeze alone will give results of this character, when mixed with coal the question is simplified. If a coal containing 25 to 35 p.ct. of volatile matter is mixed with coke breeze so as to bring the volatile content of the product down to (say) 12 to 15 p.ct., this results in a much higher efficiency under ordinary conditions of steam generation—a fact which is not generally realized, but which in practice is of the greatest importance, especially from the point of view of selling coke breeze. This has been determined by a series of detailed tests recently carried out on a large "Cochran" boiler



"Turbine" Firebar.

equipped with a "Turbine" furnace. Under elaborate test conditions, using feed-water almost at boiling-point, a given quality of high-grade washed coal showed an evaporation of 10·2 lbs. of water per lb. of coal, whereas coke breeze gave 7·3 lbs.; the firing and attention in each case being of the best character. When the coke breeze was mixed with the coal, however, the figure for the product was found to be much above that calculated. Thus, for example, in one series of tests with three parts of coke breeze to two parts of coal the result was 10·7 lbs. of water per lb. of mixed fuel, instead of about 8·5 lbs., as might have been expected. The reason is that the increase in the fixed carbon content, and the corresponding improvement in the radiant heat emission mean a great reduction in the escape of unburnt or partially burnt volatile matter, which cannot be prevented with the use of raw coal. In many cases the results are astonishing, especially in small boiler plants not equipped with economizers.

Coke-Oven Managers' Association (Midland Section).—On April 16, at 2.30, a meeting will be held at the University of Sheffield, when a lecture on "The Combustibility and Reactivity of Coke" will be given by Prof. R. V. Wheeler. On June 11, a visit will be made to the Barugh plant of Low-Temperature Carbonization, Ltd.; and on July 9 the works of Messrs. Stainby and Lyon, Ltd., of Knottingley, will be visited.

MIDLAND JUNIOR GAS ASSOCIATION.

The Annual Meeting of the Association was held at the Council House, Birmingham, on Friday, March 27—Mr. HARRY CLARK presiding.

THE RECOVERY OF WASTE HEAT FROM FURNACES.

By WILLIAM NEWTON BOOTH, B.Sc., A.M.Inst.C.E.

When I was asked by your Secretary to prepare a paper, I chose a subject which had been occupying my attention for some time and one in which industry in general was interested, unaware that only a few days before the paper was to be presented you were to listen to a discourse on waste-heat boilers by a member of the staff of a firm who are doing a great deal of work in this direction. In spite of this, I trust that I shall have something interesting to say to you, and be able to show that, useful as waste-heat boilers are, they are not necessarily the complete and final answer to all waste-heat problems.

It is now recognized as an industrial axiom that waste of any kind must be stopped, if we are to compete with our products in the world's markets; and the annals of our industrial progress during the last century record many instances of the recovery and use of so-called waste products. Not least among these is the tremendous development which has taken place in the use of coal tar. Far from being considered a waste product, it now figures largely on the revenue account of all coal carbonization processes. While I do not pretend that the utilization of otherwise waste heat will have such far-reaching and important effects, yet it cannot be denied that the cost of heating in nearly every branch of industry is far from being a negligible item in the expenditure account; and in many industries—*e.g.*, iron and steel—it is the principal item. Moreover, the thermal efficiencies of the processes in use are often very low indeed, and in nearly every case leave much room for improvement. If also we remember that our fuel reserve supply is a constantly diminishing quantity, there is every reason for giving most careful attention to the conservation of fuel; and the recovery of waste heat is the first step in this direction.

WASTE HEAT FROM FURNACES.

Let us inquire into the nature of waste heat in connection with the operation of furnaces. In all such appliances fuel is burnt in oxygen (usually obtained direct from the atmosphere, accompanied by four times its volume of nitrogen), and the resulting flame consists of various gases heated to a high temperature. In the furnace these gases are required to give up their heat in a chamber at a relatively high temperature, and must consequently leave that chamber at a temperature somewhat above this, and carry away as sensible heat a more or less large proportion of the heat of the original fuel. This rejection of heat in the spent gases is inherent in all appliances or processes where heat is generated in, and carried by, a material fluid. In all such cases the availability for use of the heat present is a question of the temperature changes through which the heated fluid can be taken; and it is inevitable that some should be rejected. It is principally this question of the effect of temperature on the availability of heat which makes the heat engine such a relatively inefficient machine; very large quantities of heat—generally, however, at a low temperature—being necessarily discharged in the exhaust. Were it not for this inherent low efficiency of the heat engine, there is little doubt that fuel furnaces would be entirely replaced by electric furnaces for anything but quite low temperature work, because, with electrical heating, no heated material fluid need necessarily leave the hot chamber. However, the high-efficiency heat engine being an impossibility, fuel furnaces will continue to be used; and it behoves us as engineers to improve them in design, operation, and thermal efficiency.

When any fuel is burnt, the combustion gives rise to a perfectly definite amount of heat which is expended in raising the temperature of the flame gases. It will be manifest that, if the fuel is incompletely consumed, only that portion which is actually burnt in the combustion can be reckoned; and if an excess of air or oxygen is used, this can take no part in the actual combustion, but will merely add to the quantity of gases to be heated. The highest temperature is therefore reached when perfect combustion is obtained without any excess of air, and the temperature will be markedly less if such exact regulation of the air is not secured. The quantity of heat which can be given up by the flame gases in the heating chamber is clearly the product of their quantity, mean specific heat, and the difference in temperature between the flame gases and the waste flue gases—*i.e.*, the efficiency of heat transmission in the heating chamber cannot exceed the fraction

$$\frac{\text{theoretical flame-gas temperature} - \text{flue-gas temperature}}{\text{theoretical flame-gas temperature.}}$$

If this efficiency is to be increased, we must do one of two things—either increase the flame temperature or decrease the flue temperature. The latter is governed by the heat of the chamber itself, usually fixed by the conditions of the process; and apart from arranging ports and flues so as to give adequate circulation of the flame gases, comparatively little can be done

in this direction. We must therefore look towards increase in flame temperature as the best solution. This can be done in two ways:

(i) By careful regulation of the air for combustion.
(ii) By preheating as far as possible the air and/or fuel.

Fig. 1 shows the proportion of the calorific value of average coal gas fuel available for transfer in heating chambers at various temperatures and for different regulations of the air supply, but no preheat. The importance of correct regulation of air supply is apparent.

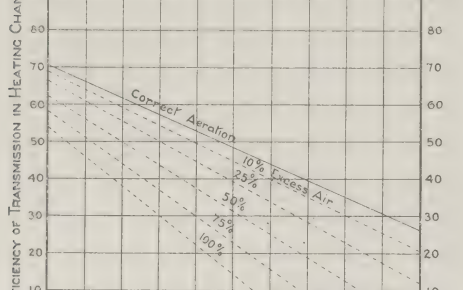


Fig. 1.—Maximum Efficiency of Heat Transmission.

It is manifestly foolish to attempt improvement by the addition of apparatus for preheating until everything possible has been done by fuel and air regulation. Fig. 2 shows the effect of preheat, assuming theoretically perfect regulation of air supply.

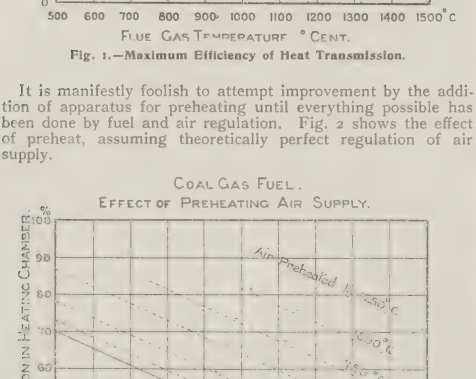

Coal Gas Fuel.
Effect of Preheating Air Supply.
Efficiency of Heat Transmission in Heating Chamber.
Air Preheated to 250° C
Cold Air
Flue Gas Temperature °Cent

Fig. 2.—Maximum Efficiency of Heat Transmission.

The effect of preheating on the chamber efficiency of high-temperature furnaces will be seen to be very great.

It is important to reduce the loss of heat through the walls of the heating chamber, as any reduction effected here has a double effect—*i.e.*, in the chamber and in the flue. Careful wall construction can do much in this direction. The use of materials of low conductivity is becoming more and more common, and composite walls (an inner refractory lining to withstand high temperatures, and a backing of insulating material) are now usual features of furnace design. Fig. 3 shows the actual values of the losses which may be expected from such walls of various thicknesses. If, however, in addition to careful wall construction, the heat loss which must inevitably take place through the outer walls can be taken from the flue gases instead of from the chamber gases, an additional saving will be effected, as such transfer can take place without necessitating additional gases to pass through the heating chamber. It is not always possible to make this arrangement; but in many cases it may be done by constructing the primary waste gas flues so as more or less completely to surround the heating chamber proper.

Let us now pass on to the waste gases. It is manifest that those which leave the furnace chamber by leakage are lost to all practical purposes, and with them their sensible heat; and if any waste heat recovery is to be attempted, careful attention must be given to the prevention of such leakages, ensuring that as much as possible of the hot waste gases enters the

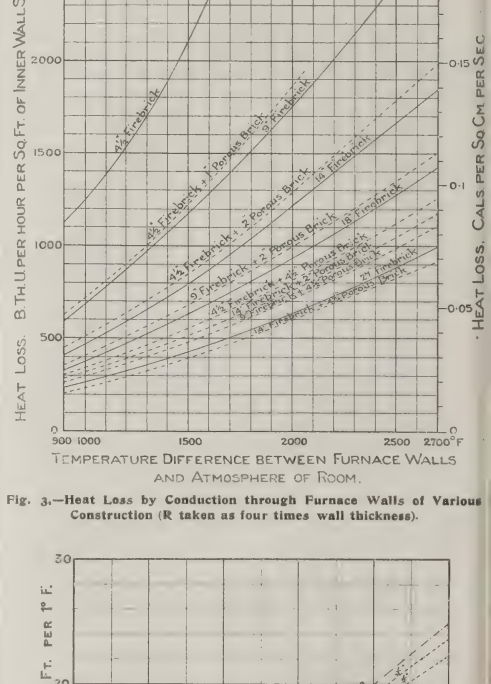

Temperature Difference °Cent.
Heat Loss. B.Th.U. per hour per Sq.Ft. of Inner Wall Surface
Heat Loss. Cals. per Sq.Cm. per Sec.
4½" Firebrick
9" Firebrick
4½" Firebrick + 2" Porous Brick
9" Firebrick + 2" Porous Brick
18" Firebrick
4½" Firebrick + 4½" Porous Brick
9" Firebrick + 4½" Porous Brick
18" Firebrick + 4½" Porous Brick
9" Firebrick + 9" Porous Brick
18" Firebrick + 9" Porous Brick
Temperature Difference between Furnace Walls and Atmosphere of Room.

Fig. 3.—Heat Loss by Conduction through Furnace Walls of Various Construction (R taken as four times wall thickness).

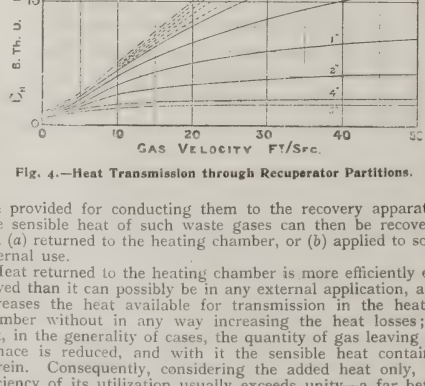


Fig. 4.—Heat Transmission through Recuperator Partitions.

flue provided for conducting them to the recovery apparatus. The sensible heat of such waste gases can then be recovered and (*a*) returned to the heating chamber, or (*b*) applied to some external use.

Heat returned to the heating chamber is more efficiently employed than it can possibly be in any external application, as it increases the heat available for transmission in the heating chamber without in any way increasing the heat losses; in fact, in the generality of cases, the quantity of gas leaving the furnace is reduced, and with it the sensible heat contained therein. Consequently, considering the added heat only, the efficiency of its utilization usually exceeds unity—a far better result than can be expected of an external application of the same heat. It is therefore towards returning to the heating chamber the largest possible fraction of the waste heat leaving the same that we must look for the highest efficiency of utiliza-

tion. There are cases where this is not feasible or where there are other sources of heat or the amount of waste heat available is much greater than can be utilized in this way. Thus in many cases there will inevitably be a certain amount of waste heat available for use external to the furnace; but it may be taken as a general thing that it is better to make a furnace self-recovering of its waste heat as far as possible, before attempting to recover waste heat for external uses.

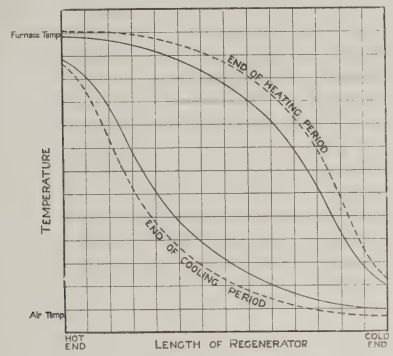


Fig. 5.—Temperature Changes in Regenerator Chequerwork.

A simple arithmetical calculation may make the argument clearer. Let us consider a small gas-fired furnace having 4½-in. walls, the total internal area being (say) 13 sq. ft., working at 1000° C. and consuming 1 therm per hour. Then the flue loss (from the diagram) is 52 p.c. and the wall loss 0·4 therm per hour. The heat balance is, accordingly, as shown in Table I., item 1. Supposing a heat recovery plant in the shape of (say) a steam boiler is attached to the flue, then 10 p.c. of the gross value of the fuel will be lost as latent heat;

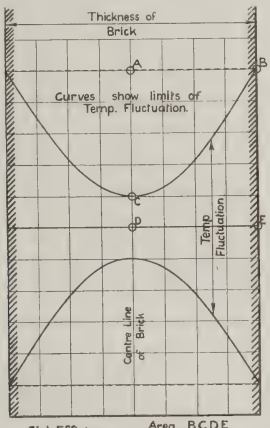


Fig. 6.—Meaning of Slab Efficiency.

and assuming the boiler has an efficiency of (say) 70 p.c., there will be recovered usefully $(0{\cdot}52-0{\cdot}10)\times 0{\cdot}70=0{\cdot}294$ therm, giving a net consumption of 0·706 therm, of which only 0·08, or about 11 p.c., is usefully employed.

If we now improve the wall construction by adding (say) 2 in. of insulating material, we shall reduce the wall loss to one-quarter of its old value—viz., 0·10 therm per hour—and to get the same useful work from the furnace, the consumption will be $0{\cdot}08+0{\cdot}10+\frac{52}{48}\times 0{\cdot}18=0{\cdot}375$ therm, and the net consumption will then be 0·264 therm, as shown at item 2.

If still further improvement is made by fitting a false interior, so that the hottest waste gases encircle the heating chamber on the way to the flue, it is possible to take as much as 60 p.c. of the wall loss from the waste gases. The net wall loss is thus only $0{\cdot}04\times\frac{100}{48}=0{\cdot}25$ therm per hour, and the total fuel consumption $0{\cdot}08+0{\cdot}04\times\frac{100}{48}=0{\cdot}25$ therm per hour; the distribution being as shown at item 3 of the table.

If we now fit a recuperator with an efficiency (on air only) of (say) 75 p.c., we shall get an air temperature of about 540° C., and the flue loss will be correspondingly reduced, with an increased efficiency, as shown at item 4 of the table. With the fitting of a recuperator the temperature head in the furnace chamber will be increased, and it should then be possible to double the output from the furnace. The wall loss would remain the same, and the flue loss would not increase in the proportion of the increase in work. The results to be expected are shown as item 5 of the table.

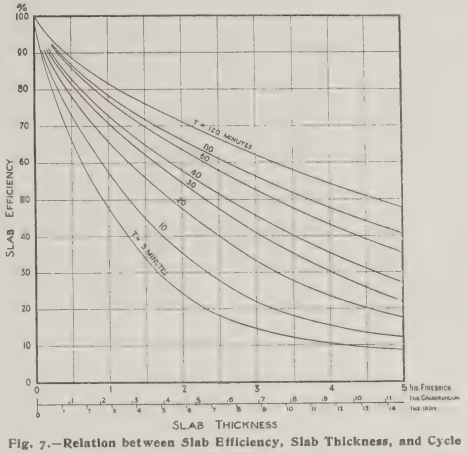


Fig. 7.—Relation between Slab Efficiency, Slab Thickness, and Cycle Periods.

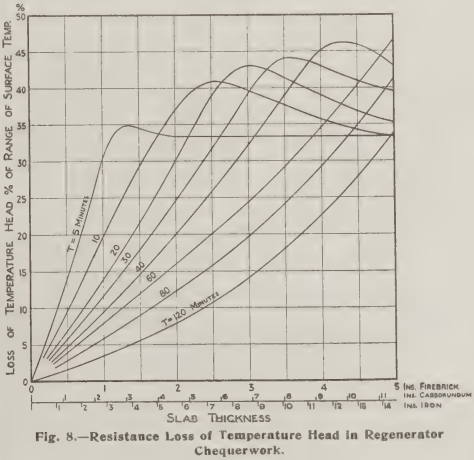


Fig. 8.—Resistance Loss of Temperature Head in Regenerator Chequerwork.

It will be seen that in every case an attempt to use the waste heat in the furnace itself is accompanied by a decrease in net fuel consumption after due credit has been given for the value of any available waste heat; and if we were to continue the process further, a still further decrease would be found.

Table I.

Item.	Particulars of Furnace.	Distribution of Heat, Therms per Hour.				Distribution of Heat.			Credit for Waste Heat.	Net Heat Consumption.
		Work.	Watts.	Flue.	Total.	Work.	Watts.	Flue.		
						P.Ct.	P.Ct.	P.Ct.	Th.-hr.	Th.-hr.
1	Furnace, plain 4½ in walls	0·08	0·40	0·52	1·00	8·0	40·0	52·0	0·294	0·706
2	,, wall 4½ in., 2 in. insulation	0·08	0·10	0·195	0·375	21·3	26·7	52·0	0·111	0·264
3	As 2, with inner chamber	0·08	0·10	0·07	0·250	32·0	40·0	28·0	0·031	0·219
4	As 3, with air recuperator	0·08	0·10	0·05	0·230	34·8	43·5	21·7	0·019	0·211
5	As 4, but doubled output	0·16	0·10	0·075	0·345	46·4	29·0	24·6	0·035	0·310

There are three things going into a furnace heating chamber to which some of the sensible heat of its waste gases can be transferred and carried thereby back into the heating zone. In the order of their effective importance they are:

(i) The work to be heated.
(ii) The air for combustion of the fuel.
(iii) The fuel itself.

Owing to its relatively small volume, and the fact that some of the hydrocarbons suffer thermal decomposition at temperatures above (say) 700° C., it is not always an economic proposition to preheat coal gas. With coal producer gas of the Mond type, however, the thermal capacity of the gas exceeds that of the air, and when preheated to high temperatures, endothermic reactions take place between the constituents of the gas, resulting in an actual increase in its calorific value. In such cases preheating of the gas has a very marked effect. To many furnaces, however, producer gas is delivered hot; and as by no means can it be heated above the temperature of the waste gases by utilizing their waste heat, nor those gases cooled thereby below the temperature at which the fuel gas is supplied, there must necessarily be a balance of waste heat which cannot be utilized in the furnace and is therefore available for use elsewhere.

Recuperators.

In this type working is continuous; the hot waste gases and the gas or air to be heated flowing practically in opposite directions on either side of a solid partition or diaphragm through which the heat is transmitted by conduction. The usual material is fireclay; and much ingenuity has been displayed in designing constructions to overcome the inherent defects of this material. An ideal recuperator should be compact, be capable of high rates of heat transmission with a small temperature loss, and be capable of use for long periods while still remaining gas and air tight. The material should therefore be of high thermal conductivity, non-porous, and of sufficiently high mechanical strength to allow of the use of thin partitions; while the construction should also be such that movements due to differential thermal expansion do not cause undue stress in the material, nor give rise to cracks or broken joints. On all these points fireclay leaves much to be desired.

The use of metal recuperators is now becoming common in low-temperature work—*e.g.*, preheating of air for boiler firing—and the advent of heat-resisting metals such as calorized iron, the chrome steels, and nickel chromium alloys (the latter of which may be made non-scaling at temperatures of over 1000° C.) has made possible the use of metallic partitions in furnace recuperators; and their use will no doubt extend considerably. Owing to the superior strength and thermal conductivity—over fifty times that of firebrick—very high heat transmission can be obtained, and a compact efficient design is possible.

Owing to the stresses set up by differential expansion, it is unwise to work fireclay partitions with a greater temperature difference between the faces than 120° Fahr., corresponding to a heat transmission of about 1200 B.Th.U. per sq. ft. per hour for a 1-in. partition, and proportionately less for thicker partitions; and this, together with the porosity of firebrick, which limits the allowable gas velocity, imposes a very low heat transmission limit in fireclay recuperators. Such considerations, however, do not apply to the metallic type.

Heat Transmission.

When a gas is flowing in a tube or channel, there is always close to the wall of the channel a film, the thickness of which depends upon the gas velocity, which is in streamline motion—*i.e.*, the flow is everywhere parallel to the solid surface. The transmission of heat through such a film is by conduction; and as gases are very poor conductors of heat, this film offers a very great resistance, and a corresponding loss of temperature head. In recuperators, of course, this effect is felt on both sides of the partition. As the thickness of this streamline film gets less when the gas velocity is increased, the resistance to the flow of heat diminishes also; and consequently, with a given temperature difference, much greater heat transmission can be effected when the gas velocity is high than when it is low.

At low velocities the combined resistance of the two streamline films is comparable with the resistance offered by (say) an ordinary thin fireclay partition, so that it may constitute the greater part of the total resistance; and little advantage would then be felt by making the partition thinner, or constructing it of metal. At higher gas velocities, however, the resistance of the partition becomes relatively much more important; and it is then that the advantage of metallic partitions becomes most apparent. Then, owing to the higher rates of heat transmission obtained, it is possible, without loss of efficiency, to reduce the transmitting area to such an extent that, in spite of the higher gas velocity used, only a relatively small increase in pressure head is necessary to force the air through.

It will be clear that the most efficient recuperator is obtained when the gas and air flow are truly counter-current—*i.e.*, the streams on either side of the partition are everywhere in opposite directions. The kind of heat transmission rates to be expected with various gas velocities and for various partitions are shown on fig. 4. Before leaving the subject of recuperators it should be pointed out that these appliances lose heat through their outer walls in exactly the same way as furnace heating

Table II.—*Performance of Recuperators.*

Type of Recuperator.	Illustrated in Fig. No.	Particulars of Partition. Material.	Thickness.	Area of Heat Transmitting Surface.	Waste Gas Particulars. Volume of Waste Gas at 60° F.	Cross Sectional Area of Passage.	Velocity of Flow (Corrected to 60° F.)	Frictional Resistance to Flow.	Temperature of Gases. Initial.	Final.	Volume of Air at 60° F.	Cross Sectional Area of Passage.	Air Side. Velocity of Flow (Corrected to 60° F.)	Frictional Resistance to Flow.	Temperatures of Air. Initial.	Final.	Temperature "Head." Hot End. θ'.	Cool End. θ''.	Logarithmic Mean. θ_m.	Heat Transmitted to Air. Total.	For Square Ft. of Transmitting Surface per Hour.	Coefficient of Transmission B.Th.U. per Hour per Sq. Ft. per 1° F.	Approximate Heat Account. To Air.	Remaining in Waste Gases.	Lost in Radiation, &c.	Recuperator Efficiency.
			Inches.	Sq. Ft.	C.Ft. per Hour.	Sq. Ft.	Ft. per Sec.	Ins. W.G.	° F.	° F.	C.Ft. per Hour.	Sq. Ft.	Ft. per Sec.	Ins. W.G.	° F.	° F.	° F.	° F.	° F.	B.Th.U. per Hour.	B.Th.U.	C.n.	P.Ct.	P.Ct.	P.Ct.	P.Ct.
Natural Draught:																										
Baffle and wall. . .	170	Fireclay	4½	55	6800	4·75	0·4	0·02	1450	1000	3100	2·15	0·4	0·02	60	560	890	940	914	30,075	547	0·6	16·5	67·5	16·0	36·0
Tile	171	,,	1½	55	6800	0·83	2·3	0·05	1450	710	3100	0·375	2·3	0·03	60	820	630	850	732	47,050	856	1·17	25·8	61·0	13·2	54·6
Horizontal tube . .	172	,,	1	65	6800	1·00	1·9	0·03	1450	780	3100	0·34	2·5	0·03	60	866	590	720	652	49,200	820	1·26	27·0	55·9	17·1	57·5
Vertical tube . .	174	,,	1	60	6800	0·95	2·0	0·05	1450	780	3100	0·25	3·4	0·05	60	890	560	720	635	51,600	860	1·35	28·3	55·9	15·8	39·6
Forced Draught:																										
Vertical tube . .	178	Nichrome	1/8	12·2 28·0*	4200	0·23	5·0	0·4	2200	630	3500	0·125	7·8†	5·0	60	1700	500	570	534	118,000	9670 4210*	18·1 7·9	63·6	26·6	9·8	76·5

* Area of heat transmitting surface increased on gas side by the addition of "fins." † The "effective" velocity is much higher than this owing to the presence of spiral baffles in the air passages. Note the high resistance to flow.

chambers, and such loss should be reduced by decreasing the exposed area and constructing the walls of material of low conductivity. It should never be forgotten that the primary function of a recuperator is to *heat* air or fuel gas, and that the cooling of the waste gas is only secondary and consequential.

The following table gives particulars of the actual performances of some recuperators the author has had occasion to test.

Regenerators.

In this type two chambers are provided, fitted with valves so that the waste gas and air to be heated are passed alternately therethrough; the gas and air flowing in opposite directions. The chambers are filled usually with chequer brickwork which alternately absorbs heat from the hot gases and gives it up again to the air.

The following points arise in connection with the design and operation of regenerators:

(1) Their operation is intermittent, and involves the provision and working of change-over valves. They are therefore not so simple as recuperators, and not so suitable for relatively small installations.

(2) At each reversal the fuel gas or hot air contained in the regenerator at the time is passed direct into the flue, while the cooled waste gas returns to the furnace. Unless care is taken in working out the proportions of the design, this may have a very appreciable effect in reducing thermal efficiency.

(3) The hot regenerator provides a considerable store of heat; and this may be returned to the heating chamber very rapidly, if occasion requires it. For some processes where a very rapid rate of initial heating is required, followed by a period of slower heating or maintaining the work at a high temperature, this property of the regenerator may be used to advantage.

(4) The capacity of the regenerator as compared with the furnace fixes the period which may elapse between reversal of the valves; and this may be varied between relatively wide limits so as to meet the needs of the particular problem under consideration.

(5) The heat capacity of regenerator furnaces is considerable, and consequently they are not so suitable for intermittent working as furnaces having a lower heat capacity.

So far as the author is aware, no complete theory of the heat transmission of a regenerator has yet been worked out. The following factors however affect the design of such apparatus and the calculation of the amount of brickwork necessary in any particular case.

Surface Temperature Changes in Chequerwork.

Fig. 5 shows the progressive temperature changes which take place during the heating-up of a regenerator chamber. It will be seen that at the ends of the chamber the range of temperature is comparatively small, while in the middle it is much greater. The mean temperature range of the surface is as indicated on the figure, and is usually not much more than half the temperature difference between the hot and cold ends. The actual figure in each case may be obtained or worked out from a design, and may be expressed as a factor which the author terms "surface temperature efficiency."

When the surface of a conducting material is subjected to a periodically varying temperature, the range of temperature at internal points in the material becomes steadily less as we recede from the surface, and the phase of the temperature change becomes likewise progressively later. Fig. 6 indicates this effect, showing the temperature of the various portions of the material at the commencement and at the end of the heating period. It will be seen that the heat stored is much less than would be the case if all the material were to go through the same temperature range as the surface, and the ratio of the heat actually stored to that which would be stored under these conditions is called the efficiency of utilization of the material, or more usually the "slab efficiency" of the chequerwork. The values for various chequerwork and times of reversal are shown in fig. 7.

There is still another factor to consider. Owing to the above-mentioned phase lag of temperature change—due to the fact that all conducting material offers a certain resistance to the flow of heat—the temperature of the surface during cooling lags behind the corresponding temperature during the heating period—*i.e.*, heat is always given out at a lower temperature than that at which it was stored—and this causes a further loss of efficiency. The value of this is shown on fig. 8 for different values of slab thickness and reversal time.

Having given the capacity of a particular furnace and the reversal time desired, we are now in a position to estimate the amount of chequerwork required in the regenerator. First calculate the total amount of heat contained as sensible heat in the waste gases during the period of one reversal—*i.e.*, half-cycle of operations. Let its amount be H. Then, if w is the weight per unit volume of the chequer material, s its specific heat, $(\theta_f - \theta_a)$, the difference between the temperature of the furnace and atmosphere, T the surface temperature efficiency, S the slab efficiency, and R the loss of efficiency due to resistance for any particular thickness t of slab chosen, we have

Heat absorbed and restored $= Q.w.s.\ (\theta_f - \theta_a)$ T.S. $(1 - R)$

where Q is the actual volume of chequer material, and is equal to $\frac{A\,t}{2}$ where both sides of the slab are exposed. The total area necessary to absorb the amount of heat H (*i.e.*, the total of gas and air regenerators) is then

$$A = \frac{2\,H}{t.w.s.\text{T.S. } (1 - R)\ (\theta_f - \theta_a)}.$$

Our argument so far has taken no notice of the difference of temperature which must exist between the solid surface and the gases in order to effect the transmission of heat between them. This difference depends upon the disposition of the solid surfaces, the distance apart, and the velocity of the gas flow. As in the case of recuperators, the best results are obtained by the use of thin solid slabs, narrow gasways, and high gas velocity, though it will be realized that the presence of dust in the gas streams, and the necessity for mechanically sound constructions, tend to place a limit to fulfilling our desires in these directions.

In the author's opinion, recuperators are preferable to regenerators for small furnaces, especially those where it is not necessary to have a large storage of heat for occasional use; and by careful attention to design they may be made very compact and highly efficient, and the heat losses due to the conduction through walls reduced to a very low figure. Regenerators will, however, continue to hold their own for very large installations where the added complication of reversing valves is not a serious drawback, for furnaces where a sudden large increase in heating rate is required occasionally, and also for large furnaces working at temperatures sufficiently high to cause rapid deterioration of the material of a recuperator.

We may sum up the conclusions at which we have arrived as follows:

1. It is better to arrange, if possible, for the heat conducted away through containing walls to be supplied by the spent gases rather than from the flame gases in the heating chamber.
2. Waste heat recovered and returned to the heating chamber can be utilized at a higher efficiency than in any external appliance.
3. Therefore it is only after full self-recovery has been practised that the recovery of waste heat for external purposes should be attempted.

Discussion.

The President said the paper was interesting to all, and particularly to those engaged on the industrial side of the gas industry.

Dr. Walter (Birmingham Gas Department Research Laboratories) proposed a vote of thanks to Mr. Booth. The subject discussed was, he observed, of especial interest to him. The design of furnaces did not receive the attention it deserved. While engineers had improved the efficiency of prime movers, inefficient furnaces were still installed. The figures obtained by the author were remarkably good. It appeared to him there were great possibilities in the use of nichrome as applied to recuperators. He would like to know what Mr. Booth's experience was of calorized steel recuperators.

Mr. J. H. Gee (Senior Vice-President) seconded the resolution.

Mr. Booth, replying to the vote of thanks, said he had used calorized iron with fairly good results; but with other calorized material his experiments had not been pursued. He had found calorized steel inferior to nichrome. Regarding the insulation of smaller furnaces, he pointed out that no standardized policy could be followed. If the furnace were to be used for short periods, it was no use insulating at all; but if it were to be used for a long time, then it was advisable to insulate. It was important to keep down the heat capacity of the furnace itself.

Leakage Surveys.

A paper on the reduction of gas losses was presented at the sixth annual convention of the Natural Gas and Petroleum Association of Canada, by Mr. Victor A. Ogilvie, Engineer to the Dominion Natural Gas Company of Buffalo, who describes a suitable installation for test connections employed on a leakage survey, where the main system is divided into small sections for testing separately. Three 1-in. taps are made in the main, and two rubber gas main bags are inserted at the centre tap, and inflated. A 1-in. riser is then screwed into the centre tap or bag hole, and water is poured into the riser until a hydraulic head is obtained which balances the gas pressure on each side of the inflated bags. If gas bubbles appear in the riser, it is an indication of leakage past one, or both, of the bags, and the trouble must be corrected. Insufficient inflation, sediment in the main, or other troubles, may necessitate re-setting the bags to secure a positive seal. One of these bag installations is required at each point where stoppage is needed to secure a completely isolated section. It is very necessary that each bag installation is an absolute seal, as the accuracy of results depends a great deal upon the degree of skill exercised in securing a complete isolation of the tested section. To proceed with the test, a portable test meter is connected with flexible hoses attached to the 1-in. taps on either side of the gas bag space. The meter is equipped with valves and unions necessary for control and convenience in erecting and dismantling the set-up. There is a gauge to indicate the pressure of the gas measured. If there is too much pressure fluctuation to assure reliable measurement, it is advisable to insert a regulator in the riser stem on the outlet side of the installation. A by-pass is provided, to speed-up the flow of gas in filling the isolated section in the case of a large-capacity test.

THE MODERN DRAWING OFFICE: ITS PLACE IN THE SCHEME OF GAS-WORKS MANAGEMENT.

By J. E. Ledingham, of the Tottenham District Light, Heat, and Power Company.

[Before the London and Southern District Junior Gas Association, March 20.]

In undertaking to read a short paper on the drawing office, I am afraid that it will hardly be possible to bring forward entirely new information in the space available. This remark is addressed particularly to those members present who already control drawing offices of their own—but I hope that such members will find interest in what may be a different viewpoint, and lead a useful discussion. The paper is written chiefly for those who have no great knowledge of the modern drawing office, or of its correct place in the scheme of gas-works management. A brief retrospection will be useful.

The drawing office of days gone by was undoubtedly regarded by the executive officers of most engineering concerns gas-works included—as a more or less necessary evil; "necessary" because very little constructional work could be carried out without a drawing of sorts, and evil because the drawings of that day were, perforce, only artistic pictorial representations of the completed piece, leaving very much of the detail work to the effort and judgment of the shop foreman and workmen. All honour to the pioneers on both sides; but the system was wrong. Too often was the article, as finally produced, the outcome of a system of "trial and error" during production, wherein much time and energy were misplaced and material wasted. There was little co-operation between the shop and the drawing office; and, as one may well imagine, the relationship between the heads of these sections was none too cordial. They blamed each other for failures, while each laid claim to success. Such conditions existed many years ago; but the evils have been gradually eliminated until the drawing office now stands in a proud position. It is the engineer's "technical problem solving department," and may be likened to the "hub" of the wheel of constructional activity, the axle of which is the chief engineer.

To those members not directly connected with the constructional engineering side of our business, it will not be amiss to point out that the modern gas-works—considered as a whole—is a very self-contained institution. It constructs and maintains its own general plant, buildings, roads, railways, and wharves, possesses the various workshops, machinery, and tradesmen for carrying out such work, generates its own steam, hydraulic, and electric power for driving its running plant, handles mechanically its raw materials and bye-products, and delivers the latter to customers by its own fleet of motor lorries, and so on, with all sorts of ramifications. I mention these things simply to illustrate the classes of work which the chief engineer expects his drawing office to deal with down to the minutest detail, and for which he requires designs, detail drawings, specifications, and schedules of materials, for issue to his workshops, or, if his own shops be too busy, to issue for tenders.

The drawing office, properly organized and working with method and system, thus becomes a very useful section; and I now propose to show how the duties of a small nucleus staff can be best arranged to deal efficiently and economically with such work. My explanation will be clearer if you will refer to the diagram in which the personnel of the drawing office is shown in the form of a genealogical tree.

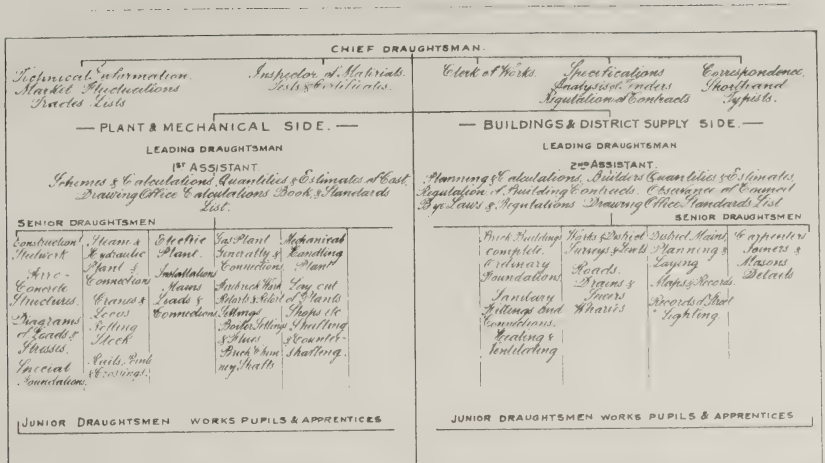
The organization of the brain values of his staff rests with the chief draughtsman; and in order that the ever-present variety of work may be efficiently dealt with, it will be clear that the nucleus staff must be carefully selected, capable, hard working, and contented men—earnest and thorough. It will be seen that the chief draughtsman deals personally with all the technical correspondence calling for details of work in hand or placed to contract, draws up all specifications, issues inquiries, and analyzes tenders, regulates contracts, correlates technical information, arranges and supervises technical experiments, directs inspection of materials, and receives the reports of the clerk of works. In addition, of course, he directs the design and passage of all work through the drawing office, and is responsible for the maintenance of discipline. In the last-named items he is directly assisted by his two leading draughtsmen; one (called first assistant) preparing the original designs for the more important schemes on what may be called the "mechanical" side, the other (called second assistant) on work of equal importance on the "building" side. These men, in turn, feed the senior draughtsmen with work, the general scheme for which has been approved by the chief engineer. The duty of the senior draughtsmen is to prepare fully-dimensioned and accurate scale general arrangement and detail drawings in pencil, and a complete schedule of materials and weights for purposes of ordering. In this they are in turn assisted by junior draughtsmen, works pupils, and apprentices, who thereby gain a very necessary experience and training. An endeavour is made to sectionize the work—that is to say, to keep the same class of work to one man, or group of men; but it is obvious that a generous overlapping of sections must and does occur. The advantages of this overlapping will be equally obvious in that it relieves the work of the monotony of sameness so far as the draughtsman is concerned, and protects the office against the unavoidable absence of individual members of the staff through sickness and holidays.

Subsequent to the completion of the pencil drawings, these are carefully checked by a senior or leading draughtsman, and are passed to the tracers (male or female), who trace the work in indian ink upon standardized sheets of tracing linen. These tracings are again checked, and afterwards passed to the printer for the requisite number of prints. There are very few drawing offices to-day which do not include in their equipment an electric photo printing copier—a cheap and speedy method by which to obtain many types of prints—*e.g.*, the "wet process" prints, "Ferro-Prussiate," "Ferro-Gallic," and "Pellett," and the dry process of "true-to-scale" prints, "Ordoverax," "Sepia," and "Ozalid." The "Ferro-Prussiate" or blue print is by far the commonest production and cheaper than any other; but it is in many ways an unsatisfactory article, shrinking unequally during the drying process, difficult to read in dark places, and likely to fade in a strong light. Its shrinkages render it unsuitable for small-scale architect's drawings whereon dimensions are conspicuous by their absence, and where the user is compelled to apply a rule or scale. White prints of the "true-to-scale" variety are used for all such work. Time will not permit a detailed description of these processes; but it may be well to state that the "Ozalid" is the most recent introduction. It produces a print having a deep chocolate line on a white ground, is true to scale, no more costly than the blue print, and is obtained more rapidly. It is handy; but its permanency only time can prove.

The recorder is employed to classify, comprehensively and accurately to index and record all office drawings and tracings, to put these away, keep them in good order, and find them rapidly when they are required. The "logging-in" of all drawings received or issued is of great importance. It requires the provision of (1) a well-bound drawing register in book form, numbered in folio and bearing printed headings to vertical columns—the headings stretching completely across the folio opening. The "headings" in sequence reading from left to right are as follows: "Series No.," "Drawing No.," "Description or Title," "Office of Origin," "Original No.," "Date Made or Received," "Correspondence No.," "Section Concerned," "Order or Contract No.," "Copies Issued and Date," "Remarks and Cross References." (2) A Stolzenberg type card-filing cabinet for the reception of coloured cards 6 in. by 5 in.—as many drawers to the cabinet as there are colours (or sections) to be considered. The cards will lie behind the usual buff-coloured alphabetical index division cards in each drawer. Each card will bear the following printed headings to vertical columns: "Description," "Maker," "Drawer," "Drawing No."

The system is extremely simple but very effective, and particularly so when a piece of work involves not only the original schemes evolved under instructions received from the chief engineer, but also a works portion and a contract portion, each forming part of the finished piece. The drawings for the entire piece of work would all bear the same series number, and would each bear a sub-number in the true chronological order of their advent. They would be found at a moment's notice, now or years hence, by reference to the cards; and if required, the history attaching to each one can at any time be obtained from the register. They will be found all together in the storage drawer, arranged with the parent drawing at the bottom, and the drawing last made or received on the top. There is no waste of space in storage drawers, since "series" is laid upon "series" until the drawer is full, and the next lower drawer of the press (emptied of its "years old" accumulation to a more remote storage) is available to receive current work. All tracings (negatives) are stored in an exactly similar manner, but in the "tracings" drawers. Only in very exceptional circumstances should the office copy be loaned to the works; and when this does occur, the early return must be urged and enforced. It may appear to one unused to a system of this kind that its adoption would lead to a large amount of clerical work. This is not so. The information required under the printed headings is simple and terse.

In a gas-works where the maintenance of running plant is of such vital importance, it is imperative that the full set of contractors' working drawings to which a plant has been constructed, should always be available. By adopting this precaution, not only can breakdowns be speedily dealt with, but the cause of a breakdown can often be traced to an inherent defect in design, undetected in the original scrutiny, the defect remedied, and the likelihood of further breakdowns in the same part be reduced to minimum. The scrutiny of contractors' drawings prior to the manufacture of new plant should receive special attention on the part of the gas-works drawing office, and the specification should be so drafted as to allow the chief


CHIEF DRAUGHTSMAN.
Technical Information. Market Fluctuations Trades Lists
Inspector of Materials. Tests & Certificates.
Clerk of Works.
Specifications Analysis of Tenders Regulation of Contracts
Correspondence. Shorthand Typists.
— PLANT & MECHANICAL SIDE. —
LEADING DRAUGHTSMAN
1ST ASSISTANT
Schemes & Calculations. Quantities & Estimates of Cost. Drawing Office Calculations Book & Standards List.
SENIOR DRAUGHTSMEN
Construction of Works
Steam & Hydraulic Plant & Connections
Electric Plant.
Gas Plant Generally & Connections
Mechanical Handling Plant
Arc-Concrete Structures.
Cranes & Lifts Setting Stock
Installation Mains Leads & Connections
Brickwork & Tank Details & Setting Fittings
Log cut of Plants Shops etc
Programs of Leads & Stresses.
Boiler Setting & Flues
Erecting & Dismantling Shafting.
Special Foundations.
Rails, Pond & Sidings.
Buckstays
JUNIOR DRAUGHTSMEN WORKS PUPILS & APPRENTICES
— BUILDINGS & DISTRICT SUPPLY SIDE. —
LEADING DRAUGHTSMAN
2ND ASSISTANT.
Planning & Calculations. Builders Quantities & Estimates. Regulation of Building Contracts. Clerk of Works Standards List. Bye Laws & Regulations. Drawing Office.
SENIOR DRAUGHTSMEN
Brick Buildings complete. Ordinary Foundations
Roads, Drains & Sewers
District Mains Planning & Laying
Carpenters Joiners & Masons Details
Sundry Fittings and Conditions.
Paths & Kerbs
Maps & Records
Grading & Tenderling
Records of Street Lighting
JUNIOR DRAUGHTSMEN WORKS PUPILS & APPRENTICES
PRINTER
RECORDER & LIBRARIAN.
TRACERS
MESSENGER.

engineer to call for any reasonable modifications to the contractors' design which he may consider beneficial. All "approved" contractors' drawings should be submitted in duplicate. Both copies should receive the registered number. One of the copies should be retained by the drawing office as "office copy," the other one should be issued to the works, to facilitate inspection during erection.

The recorder acts also as librarian—indexing under a card system those articles appearing in the Technical Press and marked for record by the chief engineer or his heads of departments. Further, he lists and puts away all catalogues received from various manufacturers. In small offices, the duty of the "recorder" may be combined with that of the printer; but in large offices it will require the whole time of one person —(say) a partially disabled employee—who will give it special and precise attention. The clerk of works acts as a link between the drawing office and the works. It is his duty to see that all work is carried out in strict accordance with the drawings and specifications issued by the drawing office. He is indispensable on all work let to contract, keeping a rigid check, and signing all vouchers daily for work carried out on a priced schedule basis. The inspector is employed to visit the works of contractors, examining and testing, gauging and stamping all such pieces of material and plant which cannot be so conveniently treated after delivery. All his reports and test sheets are filed with the contract papers. When the nature of the work permits, it is sometimes convenient to depute the clerk of works to act also as inspector, but only on visits of short duration.

In so short a paper it is not possible to devote any more time to a more detailed description of the routine duties of individuals forming the drawing office personnel, and it now remains to describe briefly the method and system by which drawings are produced, "issued to," and "dealt with" by the works section concerned.

In most cases the chief engineer institutes the "requirement," and in collaboration with his chief draughtsman decides upon the scheme in its broad outline and idea. Designs are then prepared by the drawing office probably in two or three forms; and after careful criticism and discussion, from all points of view, the necessary general arrangement and detail drawings are prepared in pencil only—for discussion with the works engineer. It is impossible to emphasize too strongly the necessity for close and friendly co-operation between the works and the drawing office; and to this end the works engineer and chief draughtsman together examine and discuss all important drawings immediately prior to their completion, in order to modify or embody features which, in the works engineer's opinion, will lead to simplification either in manufacture or in subsequent maintenance. It is also possible that his specialized knowledge of local conditions will allow of his pointing out a difficulty unforeseen by the designers. Such advice is very valuable to both designer and draughtsman, inasmuch as the very nature of their task trains them to think along prescribed lines; and though they will include all the main essentials to a job, they are apt to omit some useful trimmings, or ignore awkwardness in erection.

After consultation with the works engineer, the drawings are amended, if necessary, and submitted to the chief engineer (together with an estimate of the costs of carrying out the work) for final modifications and approval, and instructions as to the division (if any) of the work between "works" and "contractor." The chief draughtsman then issues the necessary number of shop copies to the works engineer, accompanied by a memo explaining clearly but concisely the full extent of the work to be carried out by each of the works sections concerned. The memo states also the extent of any supplies placed or being placed to contract by the drawing office, and the date that these are due for delivery. A schedule of materials required, complete down to the last bolt and washer, is placed on all shop copies issued; and it is convenient to wash-in in a standardized colour—(say) crimson lake—all pieces forming any part of the supply by contract. To facilitate the smooth passage of work through the shops, it is a recognized rule that non-standard parts shall be excluded from designs, except in very special circumstances. The enforcement of this rule has the effect of decreasing the varieties and shapes and sizes of stock held in the works store, and tends to uniformity of practice in the drawing office in the selection of those materials and sizes included in the drawing office standards list.

The foregoing procedure enables the works engineer to allocate to the job the appropriate works cost number, and to make out the necessary demand notes on the works stores for the withdrawal of the requisite materials. A duplicate set of shop copies is issued simultaneously to the clerk of works, who will report progress.

No alteration or variation is to be made to the details as shown on a completed drawing without first obtaining the consent of the chief draughtsman, whose duty it is to preserve accurate records. If the alteration is authorized, it is duly recorded on all copies extant; the office copy receiving in addition to the illustration the reason for, and date of, the amendment. In connection with this clause the writer favours the idea that the draughtsman responsible for the actual drawing-out of any important piece of work should be deputed to visit from time to time the scene of erection until the work is completed. The work of the drawing office in respect of any one job terminates at this point so far as the executive side is concerned; but after the installation has been completed, the small-scale representation is made on the general works plan, for purposes of final record.

In writing this short paper I have had in view the main principles to be observed rather than a detailed description of any one system; but I am indebted to my own Chief Engineer for his kind permission to include certain features of organization instituted by himself and which work well in practice.

Discussion.

The PRESIDENT pointed out that the main object of a gas company was to make dividends; and when any new work was projected, this was the underlying motive. Every scheme put forward must be accompanied not only by an estimate of the actual work, but also by an estimate of its working effects. Mr. Ledingham, he thought, had not stressed this point. The organization outlined by the author was Utopian. Mr. Ledingham had suggested that no alteration or variation should be made to the details as shown on a completed drawing without first obtaining the consent of the chief draughtsman. He did not quite see how the author was going to enforce this idea.

Mr. LEDINGHAM said that, regarding the financial aspect mentioned by Mr. Booth, no work was put forward until it had obtained the full sanction of the engineer, who, of course, was always supplied with an analysis of costs of the work in operation. The organization outlined in his paper referred to a large drawing office; but it was easy to conceive a smaller system based on the same idea. At all times co-operation between drawing office and works staff was not only desirable, but necessary. This co-operation was practised to advantage at Tottenham. The works engineer should be consulted before any drawing approached the stage of completion. This eliminated a great deal of after-alterations.

Mr. A. Broadbent, of the Gas Light and Coke Company, said that the lay-out outlined in the paper was admirable. Did Mr. Ledingham find it necessary to have drawings under lock and key?

Mr. Ledingham replied that confidential drawings were always locked up, but that general drawings were not. As he had stated in his paper, a recorder was employed to handle drawings. He kept a log of all drawings, and it was always possible to trace any one of them.

Mr. Cleave Cross remarked that the paper had been written from the point of view of a draughtsman, to whom, of course, the system was undoubtedly ideal. If they asked a chemist to set-out how he would like to run a works, he too, from his viewpoint, would explain an ideal system. With a scheme such as put forward by Mr. Ledingham, he suggested that the powers of the drawing office would be out of proportion.

Mr. Ledingham emphasized that unless there was give and take on both sides any system was bound to fail. All work, he pointed out, was directed by the chief engineer, and works engineers and chemists were consulted when any new scheme was proposed.

Mr. Grogono said that, from financial considerations, it was necessary that work should first go through the hands of the works engineer, who would pass it on to the draughtsman.

Mr. Frost remarked that Mr. Ledingham, at the outset of his paper, had stated that many drawings were purely artistic. He could endorse this statement. The draughtsman, of course, atoned for this by pleading for closer co-operation; and he was sure that all heartily agreed that this co-operation was necessary. The initial details of any scheme should be practical. In the South Metropolitan Company, when any important work was projected, the drawing office found out what had already been done, and they got advice from works superintendents and foremen. After the work was finished, any subsequent alterations were carefully recorded, and old drawings destroyed.

Mr. A. J. Nichols, of the Gas Light and Coke Company, remarked that little had been said about the works draughtsman, who had to be "everything combined."

Mr. Ledingham thought it preferable to have all the draughtsmen under one roof.

Mr. Bevington asked how the mains and services were recorded.

Mr. Ledingham replied that, as new mains were laid, they were drawn on large-scale Ordnance survey maps. Small sections of these maps were issued to the main-laying gangs, and all necessary information was recorded. No records of services were kept in the drawing office.

Mr. Newton Booth, in bringing the discussion to a close, said that Mr. Ledingham had given them a new subject to record in the Transactions of the Association. The idea outlined was certainly a step in the right direction.

Mr. V. P. Hart, of the South Metropolitan Gas Company, proposed, and Mr. W. R. Moger, of the Tottenham District Light, Heat, and Power Company, seconded, a vote of thanks to Mr. Ledingham.

WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.

A meeting of the Association was held at Swansea on March 21. Mr. B. J. Bell, President, was in the chair, and was supported by Mr. W. H. Johns (Engineer and Manager of the Swansea Gas Light Company), Mr. E. Ablett (Secretary), Prof. F. Bacon, M.A. (Professor of Engineering, University College, Swansea), and Mr. A. J. Bond (Aberavon). The Chairman said they were very grateful to Mr. Johns for the facilities provided, and for giving them the opportunity to visit the Morriston Works.

Mr. Johns then delivered the following

ADDRESS.

I understand that the programme of the Educational Scheme of the Institution of Gas Engineers is shortly to be published. Mr. Walter Hole has given details of the scheme to various associations; and if you have not read any reports, you will doubtless be interested in a brief outline of the scheme. The course is of interest principally to those who have just entered, or who are about to enter, the industry. Students are divided into two groups—those who have ample facilities to attend an educational institute which has the approved scheme in operation, and those who have no such facilities. In the first place I will deal with the former group. The course comprises a period of five years, divided into two phases, one of three years and one of two years. During the former phase the student qualifies for the "Ordinary" Certificate; the subjects of study for the first two years being ancillary ones—mathematics, chemistry, &c.—the third year being devoted to gas engineering and/or gas supply. When the "Ordinary" Certificate has been granted, the student qualifies during the second phase for the "Higher" Certificate. The first year of this phase is devoted to further study of ancillary subjects, and the second year to gas engineering and/or gas supply. Upon attaining the age of 23, those students in possession of the "Higher" Certificate may sit for the "Diploma." They are required to have had practical experience, must possess a general educational certificate, such as the Matriculation or an approved equivalent, and must have obtained "Higher" certificates in respect of both gas engineering and gas supply. The Sub-Committee of the Wales and Monmouthshire District Institution appointed to deal with the scheme are considering the question of two centres, one at Cardiff for eastern students, and one at Swansea for western students. In the case of students who are so unfortunately placed that they are unable to attend an educational institute having the approved course, they may study the ancillary subjects at an institution in their neighbourhood, and later, having attained the required proficiency, ask to be examined in gas engineering and/or gas supply. The City and Guilds Examinations will, of course, be open to those who are unable to undertake the course. My object in remarking upon this education scheme is to emphasize the urgency of fitting yourselves to qualify for lucrative posts; as competition is likely to be keener in the future than hitherto.

The Morriston Works.

I understand the principal object of your visit is to inspect the new works at Morriston. They were fully described in my address to the Senior Association, reported in the "Journal" for Nov. 10, 1924; and accordingly I only propose to state a few features of the works, in order to make your inspection more interesting. Ferro-concrete was extensively used. The site, consisting of virgin marsh land, made up to the extent of 7 ft., was a difficult one for the construction of foundations, which consist generally of ferro-concrete slabs supported by piles and beams. The following are also constructed in ferro-concrete: Coal grabbing pit, coal breaker pit, coke crane gantry, coke storage hoppers, tar and liquor well, elevated water tank. The works are laid out for an ultimate capacity of 12 million c.ft. of coal gas and 6 million c.ft. of water gas per diem. In designing No. 1 section of coal gas, the requirements of No. 2 section in regard to subsidiary plant were duly considered; and wherever expedient, plant and buildings have been constructed sufficiently large for such future requirements. The retort house, consisting of 14 beds each of ten retorts of large capacity, is operated on the principal of two shifts per 24 hours; each shift comprising eight hours with intervals of four hours. The retorts are charged and discharged by a Drakes' stoking machine; the discharged coke being delivered into the tube of a "G.N." hot coke transporter which forms a channel to the outside quenching bench. This transporter is also employed for feeding the furnaces; and in this case the tube, after receiving the discharge of coke from a retort, is inclined, to form a channel to the furnace mouth.

The coke is removed from the quenching bench by a crane fitted with a skip of a capacity of two tons. The skip is guided into the trough of the quenching bench, and, imposing its weight upon operating arms, automatically opens the doors of the bench. In this manner the coke feeds from the bench into the skip, which is hoisted by the crane. When the operating arms are relieved of the weight of the skip, the doors of the bench automatically close by the action of counter-balance weights working over pulleys. The coke storage hoppers, yard heap, water gas plant—this is yet to be erected—and the coke separator are set out within the radius of the coke crane; and accordingly transport of all coke, breeze, and ashes may be undertaken by the crane without recourse to separate means of sectional transport.

The engine and power house is constructed for the requirements of two carbonizing units, and embodies: Electrical generators for day and night load; coal gas exhausters; water gas exhausters (not yet installed); tar and liquor pumps; and gas compressors necessary to feed the holders at the works at Oystermouth Road through a 12-in. high-pressure connecting main. The following machinery is operated by electrical power generated on the works: Coal elevators, stoking machine, "G.N." hot coke transporter, coke quenching pumps, coke screening apparatus, coke recovery plant, sulphate of ammonia elevator and centrifugal drier. The steam necessary for driving the electrical sets is obtained from breeze-fired water-tube boilers.

Ammonia and naphthalene extraction are effected in separate rotary brush scrubbers, erected in one group and operated by common duplicate engines; the connections being arranged so that naphthalene extraction is conducted after purification. The purifiers consist of five boxes each 40 ft. square by 6 ft. deep, one of which acts as the catch box. The provision of the patent reverser valves enables the purifiers to be operated on the upward and downward or forward and backward rotation principle, as desired.

The sulphate of ammonia plant consists of a complete equipment for the production of 4 tons of dry neutral sulphate per diem. Neutralizing, by the Hooper and Weyman patent process, is effected by a special feeding device which introduces the correct proportion of alkali in the form of carbonate of ammonia into the basket of a centrifugal drier. Upon discharge from the drier, the sulphate is carried by an elevator to a high point in the building, where it is mechanically screened, and any lumps in the mass reduced to uniformly

granular condition. The sulphate of ammonia crystals fall from this elevation to the stores, and are further dried by exposure to the atmosphere in falling. I particularly recommend those of you who are interested in the manufacture of sulphate of ammonia to examine this plant, as there are very few of its description in operation. After you have inspected the works I shall be only too pleased to answer any inquiries you may wish to make.

A tour of the Morriston Gas-Works was then made under the guidance of Mr. Johns, Mr. Ablett, Mr. Cunniffe, and others on the staff of the Swansea Gas Light Company; the members subsequently adjourning for tea at the invitation of the Chairman and Directors of the Company.

Prof. Bacon then delivered the following

ADDRESS.

The lecturer said that the oldest learned society in this country was the Royal Society, which received its charter from Charles II. in 1662. It was before this Society that William Murdoch's paper on the economic employment of gas light from coal was read in 1808, for which he was awarded the Rumford Gold Medal. Of late years, technical societies and technical newspapers had multiplied to a degree which was positively embarrassing. Specialization appeared to be reaching the breaking-point. On the other hand, the inter-dependence of the industries grew greater every year. It was not very long ago that the use of gas was practically confined to domestic and street lighting. According to Sir Arthur Duckham there were now over 3000 known industries in which gas was used, on an average, in seven different processes. Mechanical engineering too had invaded an immense number of industries, and he was sure that they would agree it now played an important part in gas-works practice, as exemplified in the fine new works Mr. Johns had put up at Morriston.

The industrial prosperity of Great Britain had been built up on cheap labour and cheap coal. Neither labour nor fuel were cheap any longer; and the only hope for the future seemed to be in making the most of these now expensive basic commodities by judiciously co-ordinating the fuel producing, transforming, and consuming industries. This was a task which would entail all the scientific knowledge, all the engineering skill, and all the mutual co-operation and goodwill they could command.

The Engineering Department of the University College of Swansea would shortly possess spacious and well-equipped laboratories, the possibilities of which he hoped the local industries, including the gas industry, would exploit to the full. It was the intention to pay special regard to combustion problems. Thanks to the generosity of a firm of water-tube boiler makers, a complete boiler plant was now being installed which would be the most up-to-date experimental plant possessed by any educational institution in the country. It would comprise all the scientific instruments and auxiliaries to enable it to be used as a mighty calorimeter in which fuels could be tested on a commercial scale and under conditions reproducible in industrial plants. He invited the Swansea Gas Light Company to co-operate in enabling him to demonstrate to the industries of the district what could be done in the way of burning gas coke on a chain-grate stoker with mechanical draught, or with natural draught by aid of the "Sandwich" system which Mr. E. W. L. Nicol, of the London Coke Committee, had done so much to develop at Greenwich, Barton, and elsewhere. The combustibility of coke was a live problem for the gas industry as well as for the steam power engineer.

Prof. Bacon concluded by extending an invitation to members to attend the meetings of the Institution of Mechanical Engineers, and also to the Association to pay a visit to their new Laboratories at Singleton.

Mr. Johns expressed his gratitude to Prof. Bacon for his address. Referring to the smoke problem, he remarked that the waste taking place, particularly in their own industrial area, was very great, and vast opportunities existed for study in this work.

Mr. D. M. John (Aberdare) proposed a vote of thanks to Prof. Bacon. This was seconded by Mr. T. A. Canning (Newport).

Mr. B. J. Bell moved a vote of thanks to the Chairman and Directors of the Swansea Gas Light Company and to Mr. Johns, Mr. Ablett, and the members of the staff of the Company who had acted as their guides on the visit to the works. They were grateful to all connected with the Swansea Gas Light Company for the help given, which they highly appreciated.

Mr. T. A. Canning seconded the vote.

Hull Chemical and Engineering Society.—At a recent meeting of the Society, Mr. N. Simpkin, M.Sc., A.I.C., Director of Research to the Lancashire and Cheshire Coal Research Association, gave a lecture on "Some Aspects of Low-Temperature Carbonization."

PUBLIC LIGHTING BY GAS.

The Work of Messrs. William Sugg & Co., Ltd.

Much about public lighting by gas, together with a good deal of other information that is likely to prove of value to them, was gleaned on Thursday afternoon last by a party of some seventy municipal, county, and lighting engineers, who visited the extensive Westminster Works of Messrs. William Sugg & Co., Ltd. Assembling at the Ranelagh Works, in Chapter Street, they were welcomed by Mr. Philip Sugg, the Chairman of the Company, who devoted himself for the remainder of the afternoon to the guests—as did also the other Directors, Messrs. J. W. Lofts, W. Mattock, and Anthony Sugg.

The inspection was excellently well timed, in mid-week, when everything was in full swing, and the 750 to 800 employees were all busily occupied. That the visitors were astonished at the hive of industry into which they had walked was evident; but that they should have been surprised was only natural. As Mr. Philip Sugg himself said, the works are in a way unique, in that they have been on full time, and sometimes on overtime, for the last four years; and one is inclined to agree with him that such a gratifying state of affairs, on 80 p.ct. gas lighting, indicates that there must be some remarkable awakening in the general attitude towards public lighting. Most municipal engineers and local authorities are, he thinks, now convinced that it is impossible to serve present-day conditions with a standard of lighting applicable to former times. It is no doubt because there has been manifested—largely through the efforts of the lighting engineers—this increased interest on behalf of the public, that the firm have been fortunate enough to keep going full speed ahead over so long a period.

In many of the departments of the factory one would have liked to linger longer; but the tour was a long one, and the time-table had to be adhered to. There was an inspection of the foundry, where brass, gun-metal, iron, and aluminium are cast into various forms for all kinds of lighting components; and the machine shops, where these castings are turned and partially fitted. Then in the automatic shops all kinds of small components are turned wholly or partially by automatic machinery, in the brass finishers' shops other small components are made, and in the stamping shops sheet-metal lamp components are stamped or pressed to shape and sometimes joined together by acetylene welding. As much time as could be spared was devoted to the spinners' shops, in which spinnings of all kinds for lamp casings, reflectors, &c., are made in iron, copper, brass, and aluminium. In addition to the metal polishing shop, the assembly shops, and the tinsmiths' shops, there are testing rooms in which every lamp and burner is adjusted and thoroughly tested before leaving the factory. A department of more than usual interest is to be found in the steatite shops, which are employed in the turning of steatite for use in gas burners and also as insulators for electrical work. There are separate stove shops, in which the manufacture of gas cookers is carried on.

Early History of the Firm.

After tea, Mr. Philip Sugg told the visitors how greatly he and his co-Directors had appreciated the opportunity of showing them round the factory, and explaining to them something of the many processes which went to the making of a gas lamp. The factory had been in course of extension for a great number of years, which accounted for the fact that it was perhaps not quite what one would imagine that a modern factory would be. In a way the firm gloried in this, because it was an indication of the age of the business. It was originally started as a private business, somewhere about 1837, in Marsham Street. That was in the time of his grandfather. It was the son of that Mr. Sugg (and his, the speaker's, father) of whom many of those present had happy memories. A move was made into Vincent Street about 1861, and, as was the custom in those days, Mr. William Sugg lived on the works. In some respects the works which they had seen that day were unique—for one thing, because there were so many processes carried on under one roof. It was seldom that one came across a works so thoroughly self-contained. There was everything there that was required for the production of gas lamps for public and domestic lighting.

Progress in Public Lighting.

Mr. J. W. Lofts then lectured, with the aid of a much-admired series of photographic lantern slides, on "Public Lighting by Gas." Pictures were shown of the early gas lamps introduced by Mr. William Sugg, and then of his later designs; the step-by-step development of present-day designs being thus portrayed. He showed clearly the economy to be secured by conversion to the inverted system of lighting, and expressed his surprise that, in spite of this, it is still possible to see in London upright mantles in hundreds, if not in thousands, of cases. "If you want to save the ratepayers' money," he said, "exchange upright burners for inverted fittings." For economy's sake, many thousands of conversion fittings have been, and are being, put into use in all parts of the civilized world—all over these Islands, and also in France, Belgium, Denmark, Norway, Sweden, Egypt, India, China,

Singapore, Australia, South America, and so on. One of the latest countries to take-up conversion fittings is Turkey, where they are giving great satisfaction. Several orders have come from Egypt, where they are so satisfied with them that the process of conversion is becoming general. Two small mantles are, it is found, cheaper to maintain than one universal size. There were many illustrations shown of the well-known "Littleton" lamp, which lends itself to various clusters of burners and styles of fitting.

Mr. C. Chambers Smith proposed a hearty vote of thanks to Mr. Lofts for his lecture, and to Mr. Philip Sugg for his cordial welcome and the visit to what was a remarkable factory. They would all go away with a very good opinion of the firm and of the perfection with which they carried out their work.

Mr. Helford seconded the vote; and Mr. E. F. Spurrell also returned thanks for an enjoyable afternoon. The latter speaker said it was sometimes difficult to induce corporations to pay the price that was necessary to secure a good article; but they must endeavour to get them to buy the best.

Captain W. J. Liberty voiced his personal appreciation of the kindness of the firm in making the visit so pleasant and profitable.

Mr. S. B. Chandler, speaking as a visitor, said the subject which Mr. Lofts had taken for his lecture was one of paramount importance to each one of those present. Street illumination was one of the prime services which undertakings supplying forms of energy for lighting had to deal with; and it was highly important that ratepayers should have the best that was available. The relations of his own undertaking with the engineers and surveyors of the various Councils in the area of supply were of the happiest; and he was very glad to think that the officials in question were at all times willing to listen to proposals in connection with an improvement of the public lighting. This was a highly satisfactory state of affairs; and he submitted that, if they desired to see progress in this direction, they must have co-operation.

Captain H. F. Wilkinson (the Surveyor to the Tottenham Urban District Council) said he appreciated very much the opportunity given to engineers generally of going there and seeing over the works. Those of them who were unacquainted with anything in the shape of manufacturing on the lighting line had had a most interesting time. So far as relations with the gas companies were concerned, he also considered that co-operation was the way to assure success and efficiency.

SOME APPLICATIONS OF THE TOWN GAS FIRED BOILER.

By J. N. Williams.

References to the general subject of utilizing town gas for steam generation have been made from time to time in the "Journal." These references have surveyed the question from the aspects of cost, load factor, capital cost, and reliability. It cannot be claimed to-day that gas, in all circumstances, is superseding solid fuel; but the time is not far distant when this will be the case, for there are most pronounced tendencies in this direction. Having regard to the present cost of various forms of fuel, all one can say is that far more steam should be generated by using town gas, and that for moderate steam requirements under 1000 lbs. per hour, with any degree of intermittency in demand, where labour charges are material, there is a highly satisfactory case for town gas. Every instance must be investigated on its merits; and in this connection there are inflexible rules. Data must be investigated as closely as possible; the "rules-of-thumb" usually associated with steam generation must be forgotten; and, if a steam test is indicated to arrive at actual conditions, then a test must be conducted.

It will probably be of help to those seeking to push gas sales for steam generation if we briefly describe three installations of town gas fired boilers.

Town Gas Fired Boiler for Testing Fittings.

An interesting installation is that at the works of Messrs. J. Hopkinson & Co., Ltd., the well-known manufacturers of boiler fittings. The town gas fired boiler installed at these works is used for testing steam fittings, and has a normal working pressure of 750 lbs. per sq. in. The boiler is horizontal and is fired with a gas jet per tube without primary air, induced draught, or booster. A few particulars of this boiler will be of interest. It is capable of evaporating 343 lbs. of steam per hour from and at 212° Fahr. with 25 ft. of chimney. The diameter of the boiler is 29 in., and the length between tube-plates 4 ft. The shell plate is 1 in. thick, the tube-plates being $\frac{7}{8}$ in. The boiler has 26 tubes, 12 of which are stay tubes. For this high pressure of 750 lbs. per sq. in. there are three $1\frac{5}{8}$ in. diameter stays screwed into the two tube-plates.

On the installation of the boiler, a test was conducted, with the following result:

Working pressure	750 lbs. per sq. in.
Chimney draught	$\frac{1}{10}$ in. water gauge.
Temperature of products	352° Fahr.
Temperature of feed water	47° Fahr.
Town gas	450 B.Th.U. per c.ft. (net).
Water evaporated (actual per hour)	316 lbs.
Water evaporated (from and at 212° Fahr. per hour)	410 lbs.
Gas consumption per hour	1100 c.ft.
Gas per lb. of steam evaporated from and at 212° Fahr.	2·68 c.ft.
Boiler efficiency, unlagged	80 p.ct.

The main advantage of installing a town gas fired boiler for steam testing lies in the fact that, as a rule, the steam demand is intermittent. A batch of valves or fittings is put through together; the testing of these occupying (say) half a day a week.

At a large engineering works in London where the speciality is the overhaul and repair of feed pumps, all the testing is done by means of a town gas fired boiler. Prior to the installation of this unit, a stock of coal had to be accommodated in an already congested site, and the change-over to gas resulted in valuable space becoming available for another important operation. The costing system connected with this pump repair work was carefully organized; and one of the greatest advantages of the gas-fired boiler was found to be that the gas-meter reading gave the actual charge for the steam used in testing the repaired pump. As the steam consumption varied considerably with differing sizes of pumps, this was an important matter.

Town Gas Fired Boilers for Rubber Industry.

Among the many town gas fired boilers installed in connection with rubber process work is a notable installation at the works of the Reliance Rubber Company, Upper Thames Street, E.C. 4. Mr. Fordyce Jones has installed the most up-to-date appliances, and is adopting the most modern methods throughout. The gas-fired steam boiler has an evaporative capacity of 806 lbs. of steam per hour from and at 212° Fahr. The working pressure is from 80 to 100 lbs. per sq. in. Reducing valves bring the pressure down to 15 to 60 lbs. per sq. in. according to the demand for the particular process. The gas-fired boiler is at present supplying steam to a pair of masticating rolls, two vulcanizers, and six presses; and it is estimated the boiler has ample capacity for two additional presses. The main consideration underlying the installation of this boiler was that, owing to the nature of the processes, dust and dirt had to be entirely eliminated. The boiler has been rendered entirely automatic in action, and stand-by charges reduced to the minimum. The automatic regulation of the feed water supply is undertaken by a thermofeed which governs the steam supply to a horizontal duplex boiler feed pump. The gas supply is controlled by an automatic regulator which functions on the boiler pressure.

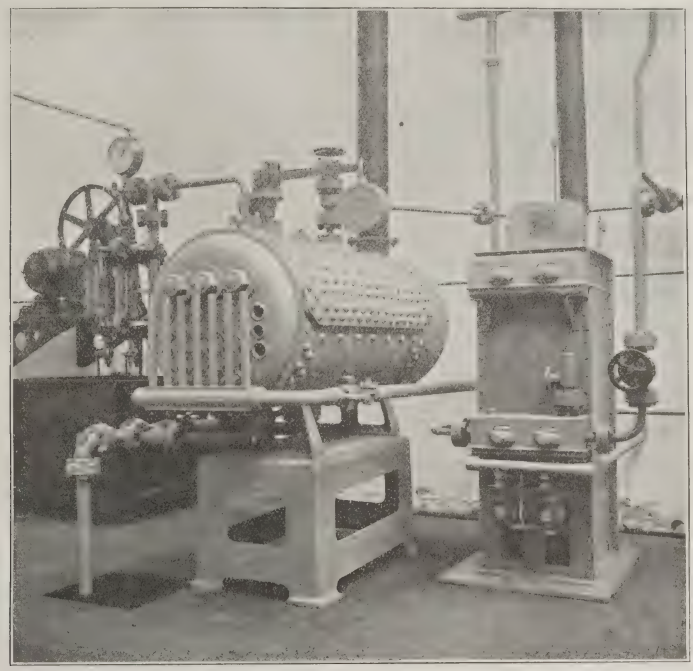
This installation is interesting to those engaged in gas sales, as we here have a case where the success of the works operations depends almost entirely on the elimination of the dirt which is a characteristic of solid fuel firing.

The Heating of the "Capitol" Cinema.

The "Capitol" Cinema, Haymarket, which was opened a few weeks ago, has been hailed by the Press as Europe's "finest and most luxurious cinematograph theatre." It is of interest to note that the "Plenum" heating is entirely dependent on gas-fired units—in this case water heaters. There are numerous unique aspects of this installation. Two boilers are installed on the roof, and as considerable lengths of chimney would have detracted from the architectural features, small induced draught fans were incorporated and sufficient flue pipe supplied to clear the roof of the low boiler house. The fans are each capable of maintaining $\frac{1}{4}$ in. W.G. Both gas-fired boilers are horizontal; the larger is 3 ft. diameter by 5 ft. 9 in. long, the smaller 2 ft. 3 in. diameter by 5 ft. 6 in. long. Under the draught of $\frac{1}{4}$ in. W.G. the larger boiler will deliver 1,280,000 B.Th.U. per hour, the smaller 700,000 B.Th.U.

The hot water circulation through the system is effected by a centrifugal pump. Though the boilers are installed on the roof of the "Capitol," the "Plenum" chamber is just above ground level. The cold air enters through a grille in the "Plenum" chamber wall. It first passes over a battery of hot water pipes, is washed, and then passed through the main heating battery. The air volume is computed from a specific allowance per person per hour. Assuming the theatre to be fully occupied, the system which is in commission warms the theatre to a temperature of 60° Fahr. prior to opening; and in warm weather the air volume can be increased and cooled by the air washer to maintain temperature conditions. The distribution of the washed and heated air is made through duct work which delivers the air into the theatre through main grilles and through smaller grilles arranged underneath the seats. The polluted air exhaust is effected through the dome by means of an exhauster fan. The whole heating and ventilating system, which was installed by Messrs. S. Mulliner & Co., Ltd., is so arranged that the air in the theatre is under a slight pressure, so that, in foggy weather, there is no risk of fog invading the auditorium.

The decision to instal town gas fired boilers at the "Capitol"



SPENCER-BONECOURT KIRKE PATENT TOWN GAS FIRED BOILER, INSTALLED AT THE WORKS OF MESSRS. J. HOPKINSON & SONS, LTD., HUDDERSFIELD. THIS BOILER HAS A NORMAL WORKING PRESSURE OF 750 LBS. PER SQ. IN.

and other London cinematograph theatres indicates that this business is well worth cultivation by gas departments.

If a gas proposition is to be really representative, the prevailing conditions must be analyzed closely, if possible in collaboration with a heating engineer. We have known of cases where the gas consumption for a gas-fired boiler has actually been based upon the catalogued duty of a cast-iron sectional boiler, regardless of whether this boiler was too large or too small. For the gas salesman there are immense potentialities in this direction for small industrial steam supplies and heating equipment. The key to the situation is just this: Every inquiry, every opening, must receive the closest analysis. The closer the investigation, the more representative and accurate the data, the better the case for the utilization of town gas.

INSTITUTION OF GAS ENGINEERS.

Programme for the Annual General Meeting, June 9 to 12.

The following is a provisional programme (subject to revision) of the Annual General Meeting, which is to be held in the Great Hall of the Institution of Civil Engineers, Great George Street, Westminster (by courtesy of the Council of that Institution), under the presidency of Mr. J. Ferguson Bell, M.Inst.C.E., General Manager and Chief Engineer to the Derby Gas Light and Coke Company.

Tuesday, June 9.

Morning: Preliminary business. Welcome of delegates from the Continent, &c. Appointment of scrutineers for election of members, associate members, and associates. Address by the President. Annual report of the Council and accounts for year 1924-25. Reports of Education Advisory Committee and the Gas Investigation Committee.

Afternoon: Paper on "The Tankless Gasholder at the Etablissements Arbel, Douai, France," by L. Rolland d'Estape, President of the Société Technique de l'Industrie du Gaz en France (Hon. Member). Discussion. Paper on "The Selection, Design, and Construction of New Carbonizing Plant at Stretford," by W. M. Carr (Member), of Stretford. Discussion.

Evening: Reception and dance at the Connaught Rooms, Great Queen Street, by invitation of the President and Mrs. Bell.

Wednesday, June 10.

Morning: Annual meeting of contributors to the Benevolent Fund. Presentation of the Birmingham Medal to Dr. Charles Carpenter, C.B.E. Reports of the Wrought Iron Tubing Committee, the Joint Refractory Materials Research Committee, the International Commission on Illumination, and the Gas Research Fellowship.

Afternoon: Paper on "Developments in Gas Calorimetry," by Prof. C. V. Boys, F.R.S. (one of the Metropolitan Gas Referees). Discussion.

Thursday, June 11.

Morning: Paper on "Town Gas for Motive Power," by Sir Dugald Clerk, K.B.E., F.R.S. (Past President). Discussion. Paper on "The Economics of Gas Production on the Thermal Basis," by George Evetts, M.Inst.C.E. (Member). Discussion. Election of honorary members. Announcement of election of President, Vice-President, and Council for 1925-26. Concluding business.

Afternoon: Alternative visits: (A) National Physical Laboratory, Teddington. (Limited to 105; ladies may attend.) (B) Fulham Works of the Gas Light and Coke Company, to view plant under course of reconstruction. (C) The Chemical and Physical Laboratories and Burner Department of the South Metropolitan Gas Company, No. 709, Old Kent Road (ladies may attend).

Friday, June 12.

Visit to Derby. (Ladies are invited.) Meet at St. Pancras, at 8.45 a.m., for special non-stop saloon train, leaving at 9.5, due Derby, L.M. & S. Railway Station, 11.37. On arrival at Derby, opportunity will be given to visit (D) the Locomotive Works of the L.M. & S. Railway and the Litchurch Gas-Works, (E) the Carriage and Wagon Works of the L.M. & S. Railway and the Litchurch Gas-Works, (F) the Gas Offices, Showrooms, and Cavendish Street Gas-Works, or (G) the Royal Crown Porcelain Works, Osmaston Road, Derby (this visit is intended for ladies only).

Luncheon in the Assembly Rooms, Market Place, by invitation of the Chairman and Directors of the Derby Gas Light and Coke Company, at 1.15 p.m., to be followed by a motor coach drive to Haddon Hall, where tea will be provided, returning to Derby by 7 o'clock for the 7.12 special non-stop saloon train back to St. Pancras, due to arrive at 9.47. Light refreshments will be available on the down journey to Derby, and dinner on the return journey to London.

The President's staff will be pleased to advise and arrange for hotel or hydro accommodation on behalf of those desirous of extending their visit beyond the Friday, upon receipt of particulars of requirements, addressed to—Mr. J. Ferguson Bell, Gas Offices, Friar Gate, Derby.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Unsealed Dip-Pipe and a Simple Alarm.

Sir,—How confusing this simple physical law of relative water levels due to vacuum in the unequal and connected chambers is, is borne out by your three correspondents, as they all three are wrong. Therefore, in the interests of that young engineer mentioned in the case, I crave space in your columns.

Correspondent No. 1 ("Journal" for March 11, p. 614) says:

"This chamber is connected with another of much smaller area (viz., 4 to 1 on illustration) containing a float, so that a small variation in the water level in the first chamber is multiplied several times in the float chamber."

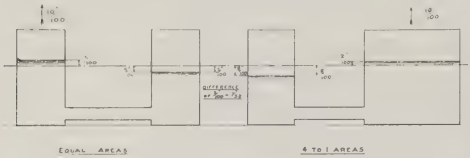
Correspondent No. 2 ("Journal" for March 18, p. 690) says:

"The motion of the float will not be multiplied by any function of the relative areas, but will be governed exactly as the pressures."

Correspondent No. 3 ("Journal" for March 25, p. 748) says:

"If the relative areas be as 4 to 1, actually there would be a magnification of the movements of the float of 1½ times."

The diagram shows two connected chambers having areas as 4 to 1,



and also two connected chambers of equal areas; and from the diagram it is easy to see that, with a fluctuation of one-tenth in the vacuum from the hydraulic mains, the descent of the float with the equal chambers will be 0·05 in., and the descent of the float with the 4 to 1 unequal chambers will be 0·08 in. Thus the increase of lift due to unequal chambers is but 0·03 in. = $\frac{3}{32}$ in., or a gain in motion of float so infinitesimally small as in no sense to warrant the adoption of unequal chambers, and so small that it totally disproves the meaning of the statement "multiplied several times."

Further, the *raison d'être* of this ingenious piece of apparatus being to increase the motion of the float, the illustration will help to show:

(1) The gain in lift for $\frac{3}{20}$ in. change of hydraulic main vacuum (*i.e.*, the stated sensitiveness of the instrument) is but $\frac{3}{8}$ in.

(2) The 1½ times increased lift stated by No. 2 correspondent should be 1¾ times.

(3) The lift of the float, if the relative areas of the chambers be increased a thousandfold, can never be doubled, to say nothing of multiplied *several* times. Floret qui Laborat.

March 26, 1925.

The Price of Coke.

Sir,—I have just received a notice from my Gas Company which informs me that they intend to increase the price of gas by an amount equivalent to approximately 10 p.ct. as and from the beginning of the Lady Day quarter. I believe this has happened, or is happening, generally. One of the reasons they advance for this increase in price is the fact that "a considerable fall in the market prices of the important residuals coke and tar has taken place."

There appears to my mind to be an enormous disproportion between the selling price of coal and that of coke. It is fairly common to find coke priced by gas companies at a figure per ton slightly in excess of that prevailing for coal in the same area. While taking into account the fact that one gets about twice the volume of coke per ton (compared with coal) there still seems to me to be an excessive charge made for material which must—from considerations of space—be regularly removed from gas-works.

Though I write as an engineer connected with a firm of contractors who do considerable business in supplying and installing coal and coke handling and gas-making plant, I fully realize there may be a flaw—of a very elementary nature—in my views. Through the medium of your columns, and by your courtesy, I therefore invite criticism on this subject, as, at the present prices, coke does not seem to me to be an attractive proposition for householders. Knowing the sliding-scale principle which is applied to gas companies' dividends, I do not suggest the threadbare charge of "profiteering."

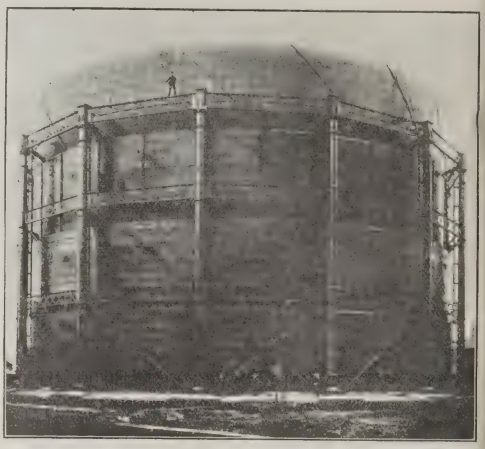
March 27, 1925. Interested.

[The foregoing letter would not have been published in the "Journal" had it not been written by an engineer connected with contractors supplying coal and coke handling and gas-making plant. The letter appears to have been instigated by a notice as to an increase in the price of gas, and by the reason attributed being the fall in the market prices of secondary products. The object of the letter appears to be to advocate lower prices for coke; and this shows a direction in which lies the interest of our correspondent. The prices that are now being charged for coke are considerably lower than they were a short time ago. We see that the Gas Light and Coke Company on the day this note is being written are advertising unbroken coke at 41s. 2d. per ton and broken at 43s. 4d. per ton, delivered free within three miles of the Company's works. This compares well with the retail price of smoke-producing coal of approximately equal calorific value. The price of coke in the gas industry is regulated by the law of supply and demand, and the demand is influenced largely by the relative values of competing fuels. We fail to understand why the gas industry should not dispose of their coke at the best price it will fetch. It would be a dereliction of duty on the part of the administrators of gas undertakings not to get as much revenue as possible from coke, seeing that the price of their primary product gas has such large dependence upon it. If a lower charge were made than that at which coke can be disposed of to-day, it follows that the difference would have to be made up by a further increase of the charge for gas. Our correspondent may rely upon gas managements regulating their coke prices so that, as far as possible, the best financial result is obtained, to the mutual interest of undertaking and gas consumers.—Ed. "G.J."]

Flying Lifts.

Sir,—We desire to call your attention, and that of the gas industry generally, to Patent No. 229,128, dated Feb. 19, 1925, by Mr. William Blakeley, for the application of the spiral system to "flying lifts" of guide-framed gasholders (new or extended), extracted in the "Journal" for March 18, p. 691.

Seeing that as far back as 1893 we successfully extended a 124 ft. diameter two-lift guide-framed holder at Rotherham to four lifts, the top or "flying" lift being on the spiral system, and that this gasholder is still in constant use, we are naturally opposing this patent.



The Flying Lift on the Rotherham Holder.

Further, we are even now approaching completion of the extension of a large holder of 2 million c.ft. capacity of two lifts to a four lift of 4 million c.ft. capacity, by the addition of one tier to the guide framing and two more lifts to the holder; the top or "flying" lift being on the spiral system. Westwood & Wrights, Ltd.

Brierley Hill, March 30, 1925.

[As far as recollection goes, our first introduction to flying lifts was in connection with the large East Greenwich holder of the South Metropolitan Gas Company in 1892, but this was not spirally guided.—Ed. "G.J."]

Explosion of Electrically-Generated Gas.

Sir,—I notice in your issue for March 25 that you refer to an explosion at Acton, which you state was caused by an explosion of gas. I think it would be well to point out to you that this explosion was not in any way connected with the gas supplied by my Company. It was caused by the fusing of a long length of electric cable, which gasified some of the bitumen coating. It was the gas generated from this that was the cause of the trouble. Coal gas or the Gas Company are not in any way concerned.

As so many of the daily papers have fallen into the error of attributing this explosion to coal gas, I would be glad if you could give publicity to the particulars now supplied. G. L. Jennings.

The Brentford Gas Company,
March 26, 1925.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for March 25.]

Nos. 7005-7711.

Berridge, J.—"Means for utilization of waste products of combustion." No. 7559.

Davis, H. N.—"Gas cookers." No. 7611.

Helps, G.—"Hotplates and gas cookers." No. 7517.

Koppers Company.—"Treating spent liquids of liquid gas purification." No. 7711.

Lilge, F.—"Gas furnace." No. 7619.

Radiation, Ltd.—See Davis, H. N. No. 7611.

Simpson, S.—"Coin-freed gas meters." Nos. 7197, 7198.

Twigg, W. R.—See Davis, H. N. No. 7611.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Reported from the Select Committee, with amendments: Horley District Gas Company (Electricity Supply) Bill and Rochdale Corporation Bill.

Select Committees have been appointed to consider the Blackpool Improvement Bill and the Oldham Corporation Bill, and will meet on Wednesday, May 6.

HOUSE OF COMMONS.

Progress of Bills.

Bolton Corporation Bill: Reported, with amendments, from the Local Legislation Committee.

Gas Regulation Act.

Copies were presented to both Houses of drafts of Special Order proposed to be made by the Board of Trade under section 10 of the Act, on the application of the Monmouth Gas and Water Works Company, Ltd.

In the House of Lords, on the motion of Viscount Peel, the draft Special Orders relating to the Biggleswade and District Gas Company, Ltd., and the Welwyn, Knebworth, and District Gas Company, Ltd., were agreed to. In the case of the latter Company, the following modifications were made:

Clause 20 (p. 9) after the words "transfer shall" insert the words "except so far as such Acts and Orders are repealed or amended and".

Clause 20 (p. 9) omit the words "continue to apply to the undertaking after that date," and insert "apply to the whole undertaking of the Welwyn Company."

Clause 44 (p. 23) after the words "Section 12 (power to purchase additional gas loads)" insert "Section 15 (amending obligations as to supply of gas)."

These Orders, together with that for the Teignmouth Urban District Council, were approved by the House of Commons, on the motion of Sir Burton Chadwick.

GAS LIGHT AND COKE COMPANY'S BILL.

HOUSE OF COMMONS COMMITTEE—Thursday, March 26.

The main provision of this Bill is to transfer the undertaking of the Brentford Gas Company to the Gas Light and Coke Company. (See "Journal" for Jan. 7, p. 30.)

Counsel for the Bill were Mr. H. P. Macmillan, K.C., Sir Lynden Macassey, K.C., Mr. W. E. Tyldesley Jones, K.C., and Mr. F. J. Wrottesley. The only petitioners appearing were the Alkali Manufacturers' Association, who were represented by Mr. W. Craig Henderson, K.C.

Other petitioners named were the London County Council and the Harrow-on-the Hill Urban District Council, but there was no appearance.

Mr. H. P. Macmillan, K.C., opening the case for the Bill, said he did not need to say much in introducing the Gas Light and Coke Company to any Committee of the House of Commons, as it was one of the best known public bodies in this country. The history of the Company, like that of many other public undertakings, had been a history of successive amalgamations and absorptions. The public interest had undoubtedly been served by the fact that gas could be supplied more cheaply when manufactured in bulk. Between 1870 and 1922 no fewer than eleven undertakings had been merged in the main Company, which now supplied about 950,000 consumers. The total capital at present was approximately £20,763,000, and the dividends were regulated by the sliding-scale.

The main purpose of the present Bill was to obtain the sanction of Parliament to the transfer of the Brentford Company to the Gas Light and Coke Company, under the terms of an agreement entered into between the parties on July 25, 1924. The agreement had been approved by both Companies, and everything, therefore, was in order. Though the area proposed to be incorporated was large in extent, it was, in parts, different in character from the other territory of the Gas Light and Coke Company.

The proposals of the Bill had been subjected to the most searching scrutiny on the part of the numerous local authorities concerned. There were no less than 35 petitioners against the measure originally, but Mr. Craig Henderson, K.C., was the sole survivor of that large—he must not say that motley—army. Great local interests were involved, and the local authorities concerned had deposited their petitions for the purpose of watching the progress of the Bill and seeing that appropriate clauses were adjusted. They were all, in effect, satisfied, as was apparent from the small list of appearances before the Committee. The Bill had survived an unusual amount of scrutiny. Accordingly, no one appeared to challenge the expediency, in the public interest, of the amalgamation. The terms as between the shareholders and debenture holders of the two Companies were satisfactory to them and were embodied in the Bill; and the only point to be determined by the Committee was that raised by the Alkali Manufacturers' Association, relating to the clauses applying the provisions of the Gas Light and Coke Company's Acts and Orders to the limits of supply as extended by the Bill, repealing certain enactments of the Brentford Company, and transferring to the Gas Light Company the unrepealed enactments. The Brentford Company, said Counsel, had its own series of Acts and Orders, but now that it was to be merged in the undertaking of the Gas Light Company, the consolidation of the two systems must be effected, and the Brentford Company had to be brought within the code of the Gas Light Company in order to produce a uniform code operating throughout the whole district. The clauses in question provided that the existing code of the Gas Light Company should, immediately after the transfer, become applicable to the extended sphere of the Company. The enactments of the Brentford Company to be repealed were set out in a schedule to the Bill. One of the sections of the Brentford Gas Order of 1924, part of which it was proposed to repeal, was section 37, which gave power to use lands for the manufacture and storage of gas. The Alkali Manufacturers' Association asked the Committee to save from repeal sub-section (2) of that section which the Bill proposed should be repealed, and to make it part of the code of the Gas Light Company in so far as it affected the district of the Brentford Company.

Section 37 (2) of the Brentford Order of 1924 is as follows:

"The Brentford Company may also:

"(A) Purchase the residual products arising from the manufacture of gas by other gas undertakers and (on any lands upon which the Brentford Company are for the time being authorized to work-up and convert their own residual products) work-up and convert such purchased residual products, and therewith manufacture other products of the same kind as the Brentford Company are manufacturing from their own residual products. Provided that the quantity of any residual product so purchased by the Brentford Company in any year shall not exceed one-third of the quantity of the like residual product which shall in that year arise directly or indirectly from the manufacture of gas by them; and

"(B) purchase from other gas undertakers and elsewhere, and use, the materials required to work-up and convert the residual products so arising from their own manufacture of gas, or purchased as aforesaid.

"But the Brentford Company shall not manufacture chemicals exclusively from raw materials purchased from sources other than gas undertakings, or in the manufacture of which the use of residual products produced by the Brentford Company or purchased from other gas undertakings is merely subsidiary."

The request of the Alkali Manufacturers' Association, said Counsel, was founded upon a complete misapprehension of the situation. So far as the Gas Light and Coke Company were concerned, they did not want any power, either in themselves or in the Brentford Company after they had taken that over, to purchase residuals from anybody else, because it was not the practice of the Gas Light Company to buy residuals from other undertakings; nor had they the power to do so, except that they could buy residuals for working-up their own residuals.

Speaking of the controversy which had existed as to whether it was right and proper for gas undertakers to buy residuals from other gas undertakers, Counsel said that the operations of gas undertakings had been very jealously watched by the heavy chemical trade, who considered that the gas undertakers were to some extent poaching on their preserves, because they were dealing with the working-up of materials into marketable products. The genesis of this practice of purchasing residuals not produced in the undertaking itself was that in small works it did not pay to set up a plant to work-up these residuals and to dispose of them; and the practice had grown of collecting residuals from a number of gas plants. Exception was taken, however, by the Alkali Manufacturers' Association to any gas undertaking handling more than its own residuals. The Association had sought to have every undertaking working in a water-tight compartment, which was a very serious restriction upon small undertakings, and, in effect, would have prevented them from disposing economically of their residuals. Counsel then referred to a number of Bills before Parliament before 1912 in which gas undertakers sought powers to purchase residuals from other gas concerns. This had aroused the vigilance of the Alkali Manufacturers' Association, and in the result a Joint Committee of both Houses of Parliament in 1912 had considered the trend of legislation on this question. The outcome of the inquiry by this Committee was that, where power was given to purchase residuals from other gas undertakers, this power should be limited to one-third of the amount produced by the purchasing undertaker. That restriction was placed upon the Brentford Company under their Order of 1924.

Why the Alkali Manufacturers' Association wanted that power retained by the Gas Light Company, in so far as the Brentford area was concerned, he did not know. The Gas Light Company had not that power in their present area. For some reason, the Association were trying to force upon the Company a power they did not want; but it was not the practice of Parliament to do this.

Until 1924, when the Brentford Company purchased the Harrow and the Richmond Gas Companies, the Brentford Company had unlimited powers to purchase residuals from other undertakers; but in 1924 that power was limited to one-third of the amount manufactured by themselves, on the representation of the Alkali Manufacturers' Association. The Gas Light and Coke Company resented the present suggestion that this power should be retained in so far as the Brentford area was concerned when they did not want it. In the first place, it was inconsistent with the policy of the Gas Light and Coke Company in the past. In 1922 they had taken over the undertaking of the Ilford Gas Company, who had powers to purchase residuals up to one-third; but this power was repealed when it was merged in the Gas Light and Coke Company. Again, if the power was retained in respect of the Brentford area, it would be difficult to work, because the Brentford output of residuals would have lost its identity completely when the area was taken over. It was part of the advantages of these amalgamations that the gas would be made at the most convenient place, and the gas supplied in the Brentford area would not necessarily be made in that area. How could it be said, therefore, what proportion of the total residuals represented the Brentford residuals? The Gas Light and Coke Company did not want a differential code applying to any part of its area.

Asked whether it would not be the same thing if the Gas Light and Coke Company accepted the power, but did not use it, Counsel reiterated that it would produce confusion in the Company's code. The logical course was that, if the Committee sanctioned the amalgamation, it should be sanctioned on the basis that the Brentford undertaking came into the code of the Gas Light Company.

Continuing, Counsel said that the Alkali Manufacturers were

naturally not really anxious that the Company should have power to purchase residuals from other undertakings, but were more interested in the proviso, which stated that the Brentford Company should not manufacture chemicals exclusively from raw materials purchased from sources other than gas undertakings, or in the manufacture of which the use of residual products produced by the Company or purchased from other gas undertakings was merely subsidiary. He believed that what the alkali manufacturers really wanted to do was to have that proviso edged into the constitution of the Gas Light Company, to whom it did not apply at the moment. It was merely stated in the petition that the clause should be preserved, with its restriction; but as the proposal of the Bill was that the clause should be repealed, in order to bring the Brentford undertaking within the general code of the Gas Light Company, the alkali manufacturers could not object. They had failed to disclose any manner in which they would be injuriously affected. In looking around for a reason as to why they had put this petition forward, he said he remembered that the Alkali Manufacturers' Association were at present in litigation with the Gas Light and Coke Company, and he could only surmise that that litigation and the present proceedings had a connection. Mr. Deuchar, the Secretary of the Castner-Kellner Company (who were members of the Alkali Manufacturers' Association), had bought shares in the Gas Light and Coke Company in order to bring litigation against them, and this litigation was started for the purpose of stopping the Company making caustic soda for the purpose of working-up their own residuals. The High Court and the Court of Appeal had both held that the Company had power to make caustic soda, but only for the purpose of working-up their own residuals; and the matter had been taken to the House of Lords. It seemed to him, therefore, that this petition was possibly deposited with a desire to obtain an advantage in connection with that litigation. The purpose of the Alkali Manufacturers' Association was to impose upon the Gas Light Company the proviso already mentioned, the meaning of which was that the Company should not encroach upon the chemical trade at large.

Mr. *D. Milne Watson* (Governor of the Gas Light and Coke Company) gave evidence, and said that the terms of the Bill were satisfactory to all concerned. The Gas Light and Coke Company had no wish to purchase residuals from outside. They had already sufficient supplies of their own; and further, he had been advised that in law the Company had no power to do so. The power to purchase from outside was absolutely foreign to the code on which the Company had carried on business; and it would be embarrassing to them, inasmuch as, after the amalgamation, the gas flowed from the various works in all directions. The gas supplied in Brentford would not necessarily be made in Brentford, and they could not differentiate between the Brentford part of the business and the remainder.

Asked by a member of the Committee how the Company would be embarrassed if they had the power but did not use it, Mr. Milne Watson admitted that, if the Company accepted the clause, it would have the effect of reducing their powers in another direction. The Company had spent large sums of money on the faith of the powers granted them by Parliament, and those powers had been upheld in the Law Courts. If the restriction contained in the clause in question was placed upon the Company, they would find it embarrassing in carrying on the businesses they were at present entitled to carry on. The proviso which would preclude the Company from manufacturing chemicals exclusively from raw materials purchased from sources other than gas undertakings would prevent the Company manufacturing caustic soda used for working-up their residuals.

Mr. Macmillan, in the course of his examination of Mr. Milne Watson, said that, if the Alkali Manufacturers' Association had said that they wanted to retain the advantage embodied in the proviso referred to, they should have treated the Committee with candour. It was apparently hoped, he supposed, that the members of the Committee, in their simplicity—if he might say so—would be induced to put a clause into the Bill which would give the Alkali Manufacturers an advantage entirely remote from what had been disclosed. This was not the way to treat any Parliamentary Committee, or Parliament, and he suggested that the reward of the Alkali Manufacturers should be that they should be driven from the seat of judgment.

Witness, replying to Mr. Craig Henderson, who cross-examined, agreed that the Company had power to purchase materials for working-up their own residuals elsewhere than from other gas undertakings; and he wished to retain this power.

Counsel pointed out that the clause at present applying to the Brentford area gave power to purchase from other gas undertakings and elsewhere materials required to convert their own residuals. Counsel then classified residuals into three groups: (1) Ammoniacal liquor; (2) tar; and (3) spent oxide. These were used in the manufacture of chemicals: and what had given rise to the dispute in 1912 was that the chemical manufacturers of the country had to look to gas undertakings mainly for their raw materials.

Witness said that if Counsel put it in this way, he might point out that, as the gas companies purchased the coal, and the bye-products came from the gas undertaking, he had always failed to see that there was an inherent right to any outside party to say that the gas companies should hand over these products for that outside party to deal in.

Counsel said that Parliament had imposed these restrictions. The gas companies were granted monopolies over large areas for the supply of gas, and were created to manufacture and supply gas in their areas. He referred to residuals as a "happy accident" in the manufacture of gas.

Witness would not accept this, and said he believed that the original object of the gas companies was to recover the bye-products. There had followed the use of gas, which had ultimately become the more important.

Counsel said that the main object was to supply gas to the community, and if the main object were the supply of chemicals there would be no reason for a monopoly.

Witness replied that when the gas industry first started there was no monopoly, and companies were operating in competition: but, owing to the difficulties resulting in connection with the pulling-up of streets, &c., monopolies were granted.

In the course of further discussion, Counsel said it had been admitted in the past that the Gas Light and Coke Company had bought residuals from other companies, and, therefore, those purchases were illegal. Mr. Milne Watson admitted that it had been done some years ago, but on a very small scale, and it had now been ascertained definitely that there was no power. It was not done at present.

Mr. Macmillan said that a legal opinion had been obtained; and the statement of the advisers was: "We do not think the Company have any power to purchase the residuals of other gas undertakers except in so far as the materials purchased may be required for the purpose of working-up the residuals resulting from the Gas Company's own manufacture of gas."

Mr. Craig Henderson said that, whatever the powers of the Company might be, which had up to now been exercised within their area, they were now seeking to apply them to the Brentford area. This meant a very considerable addition to the area of supply.

Mr. *Milne Watson* said it was a considerable addition of green fields.

Counsel said it was a territory ripe for development, with some rare and refreshing fruit for the Gas Company, and in due time they hoped to get it. He understood the case was that, merely because the absorbing company happened to be the Gas Light and Coke Company, the rights within the Brentford territory should be increased by Parliament.

Witness replied that, if the clause as it stood were applied to the Company, it would give them the right to purchase more residuals so far as the Brentford area was concerned. But he did not want this power, and, therefore, he was a friend of the alkali manufacturers.

Mr. Craig Henderson then pointed out that, while in the Bill various Brentford enactments were expressly repealed, there was saved from repeal a clause in the Brentford Order of 1881 which gave the Brentford Company unlimited power to purchase residuals.

Mr. F. J. Wrottesley (for the promoters) said that, if this were the case, he was not aware of it; and it was certainly not intended. If there was any doubt about it, it would be made clear. It had not been mentioned in the petition, however.

Answering further questions, Mr. Milne Watson said that the Gas Light and Coke Company did manufacture chemicals exclusively from raw materials purchased from sources other than gas undertakings, but to a limited extent. They only manufactured such quantities as they needed. They had also manufactured chemicals in the manufacture of which the use of residual products was merely subsidiary, to a limited extent; but he was informed that at the present moment they were not manufacturing anything.

Asked if the clause in question had not been inserted in nearly all the Acts passed by Parliament since 1914, Mr. Milne Watson would not admit this. It had, he said, been put in some. He considered it wrong that a Company who were only carrying on their own work should be asked to give up their powers in part of their district.

This concluded the evidence.

Mr. Wrottesley, at this point, said it was right that the 1881 Order of the Brentford Company contained a clause enabling them to "deal in" coal tar products and various other products. It was necessary to retain the operative part of this clause, however, because its object was to enable the Company to use certain lands for gas manufacture. It had not been realized that the power to "deal in" residuals remained; but he would undertake that those words and words of a similar kind would be deleted.

Mr. Craig Henderson, addressing the Committee, said that the Gas Light and Coke Company had been fortunate enough to obtain powers of a fairly wide character, which had enabled them to carry on an extensive manufacture of chemicals for converting their own residual products. If the Company were coming to Parliament to-day for the first time, in order to get powers, they would not be in the happy position they were in in 1868, when they obtained their consolidating Act. They would have to face the fact that ever since 1912 there had been followed the declared policy of Parliament, that restrictions should be placed upon gas companies, so that, being protected under a statutory monopoly, and having great advantages with regard to the supply of gas, they should not at the same time become competitors with other people outside who had not a monopoly of that character. As to the position of the Brentford Company, he said that only a year ago they were a smaller undertaking than at present. Last year the Company had absorbed the Harrow and the Richmond Companies, and, as the result of opposition by the Alkali Manufacturers' Association, they had had imposed upon them the model clause. Thus, only twelve months ago, this restriction, which was the declared policy of Parliament, was made to apply to this area. The Gas Light and Coke Company now came to Parliament for sanction to an agreement to absorb the Brentford Company, and, having obtained their powers under an old Act, had asked that they should be given the Brentford area free from the restrictions which Parliament had imposed upon them. Why should Parliament do this? Why could not the Gas Light and Coke Company take the Brentford area as it was? It was said that the Company had no power to purchase residuals from other gas undertakers except for the purpose of converting their own residuals; but this was a very wide power. The Company's output of gas and of residuals was enormous, and it had a huge chemical undertaking quite apart from gas supply. If there would be any difficulty, as was suggested, in working one part of the amalgamated area with another, the one part being subject to a restriction not applying to the other, then this was a very good reason for not allowing the amalgamation. Having regard to the whole of the legislation upon the subject, if the Gas Light and Coke Company were to have powers in the Brentford area extended beyond what the Brentford Company had, they should be required to prove to the Committee a very strong case. The only thing that handicapped the Company by the application of the clause in question was the proviso at the end. This, however, did not apply to the existing area of the Gas Light and Coke Company, but only to the Brentford area—the rich territory which was to be added to the Company's present area. He asked the Committee not to depart from what had been the declared policy of Parliament.

As the result of questions put by the Chairman of the Committee with regard to what happened when the Gas Light and Coke Com-

pany took over the undertaking of the Ilford Gas Company, Mr. Wrottesley handed in copies of the Ilford Gas Order of 1920, and the Gas Light and Coke Company's Order of 1922. The latter repealed the Ilford Gas Order of 1920, except the schedule and so much of section 31 as related to the lands described in that schedule—in other words, so much as allowed the manufacture of gas on those lands. This was exactly what the Gas Light and Coke Company asked the Committee to do in this case.

Mr. Craig Henderson asked if there were opposition in the Ilford case.

Sir Lynden Macassey replied that, however that might be, it represented the policy of Parliament.

After deliberating in private, the Committee decided to pass the preamble of the Bill.

Monday, March 30.

The clauses of the Bill, as amended, were approved by the Committee. In accordance with the statement made by Counsel for the Company during the proceedings on Thursday, a clause was inserted to make it clear that nothing in the Bill should confer any further powers upon the Company with regard to residuals. Originally there were clauses in the Bill enabling the Company to supply power gas (see "Journal" for Jan. 7, p. 30), but these have been withdrawn by agreement between the Company and the various local authorities. There are protection clauses in favour of the London County Council, with regard to streets and buildings; the Metropolitan Water Board, relating to the protection of their apparatus; and the Harrow-on-the-Hill Urban District Council, relating to the closing of a footpath. These clauses are in the ordinary form.

HORLEY DISTRICT GAS (ELECTRICITY SUPPLY) BILL.

(*Continued from p.* 750.)

Friday, March 20.

Mr. Tyldesley Jones, cross-examining Mr. Broadberry, said that what was called waste heat was not really waste heat, because in up-to-date works it was utilized for the purposes of the works. He put it to witness that in up-to-date gas-works, where the proper appliances had been installed, there was no more heat generated than was required by the gas-works for its own purposes.

Witness admitted that this was probably correct. There would likely be some spare power after satisfying the demands of the works, but it would not amount to a great deal. As to the Horley Works, he said they were comparatively small, but he would not admit that they were out-of-date. For a works of their size, they were efficient. He agreed that the Company had not utilized the waste heat in their works up to the present time, and admitted that this would make a difference in the cost of production of gas, but not a very material one.

Counsel suggested that the present proposal to utilize the waste heat was rather belated. Coming to the statement made by Mr. Broadberry on the previous day, that the Tottenham District Light, Heat and Power Company had supplied electricity in Wood Green at a price comparable with that charged by the North Metropolitan Electric Power Supply Company, and by the Borough of Hornsey (who were supplying in adjoining areas), he referred to the London County Council statistics of the electrical undertakings of London, showing the costs of generation and the prices charged by these three undertakings, and pointed out that the cost of, and charges for, electricity were lower in 1921, 1922, and 1923, in the case of the North Metropolitan Company and the Borough of Hornsey, than in the case of the Tottenham Company, though the two former undertakings were separate electricity undertakings, and in the latter case the Company supplied both gas and electricity.

Witness said that what he wanted to point out was that Wood Green was a case in which no independent company could have carried out the public supply of electricity to the same advantage as it had been carried out under the fostering care of the Gas Company.

Counsel said the figures did not prove this.

Witness replied that he thought they did.

Counsel maintained that the figures showed exactly the contrary. Coming to the statement that, in a general sense, gas represented heat, and electricity represented light, he said that this showed the attitude of a gas company towards electricity supply. He went on to ask if it had not been put before Parliament over and over again that, if the electricity undertakings could develop a day load, by increasing its use for power purposes, they would be able to develop electricity for lighting purposes far more cheaply than if the machinery at the power stations were used only during the short lighting period; it was only by doing their utmost to develop the use of electricity for power during the day that they could hope to cheapen the price of electricity for lighting at night.

Witness said that might be so; but God help the electricity companies if ever they got the cooking load!

In answer to further questions, witness said that a considerable amount of electricity was used for cooking purposes, but there were very few electric cookers in use anywhere around North London. Asked why, he said it was because it was so much cheaper and more beneficial to cook by gas. Electricity could not compete with gas for cooking purposes. He regarded small industrial power purposes, however, as being a suitable application for electricity. Asked if, assuming there were a demand in Horley for electric power for small machinery, electricity would be more suitable for it than gas, he said that in all probability it would, especially if the machinery had to be used intermittently.

Counsel said that the views of the Horley Gas Company were exactly the opposite to that. He quoted from a letter written to the Reigate Rural District Council on Jan. 5, 1925, in which it was stated that the obvious conclusion to be drawn from the long lists of precedents was that Parliament in its wisdom considered that any possible competition, which was the only argument for separate control, between a gas company and an electricity company, was nowadays really negligible. He asked witness whether he agreed that competition between gas and electricity companies to-day was almost negligible.

Witness would not say it was negligible; the two industries were going ahead side by side.

Counsel said that competitors generally ran side by side until one of them got ahead.

Witness replied that gas had been ahead for a long time.

Counsel: And you mean to keep it ahead by every possible means.

Witness did not agree.

Counsel said that the letter referred to went on to state that the competition was negligible for the reason that by far the greater and ever-increasing proportion—in the Horley case 60 p.ct.—of the total output of gas was used for cooking and for domestic heating and small power purposes, in which kind of service electricity, in a district such as Horley, could never compete with gas. He asked if witness agreed with that.

Witness replied that he did not agree so far as small power units were concerned, especially if used intermittently.

Dealing with statements which had been made that, if competition between gas and electricity undertakings were eliminated, economies would result, Counsel ascertained that the number of units supplied per head of population in Wood Green in 1924 was 20; and witness agreed with him that towns of the same size as Wood Green had an average consumption of 50 units per head, where two competing undertakings were operating. Counsel went on to say that the average consumption per head in England was 200, but it was only fair to say that this included large industrial districts, where an enormous amount of electrical energy was used for power, traction, and so on.

Witness said there was no demand for large power purposes in Wood Green, but the consumption per head would reach 50 units before long.

Mr. *G. M. Gill* (Consulting Engineer) said there were considerable advantages arising from the placing of the supply of gas and electricity in the hands of the one concern in a small district such as Horley. Enumerating some of these advantages, he said that it was possible to put down electrical plant in the gas-works and so avoid the necessity for procuring a new site. Horley Gas-Works had a railway siding, and this was somewhat difficult to get on a new site. There would also be a saving in rates and taxes, and there would be common offices, transport facilities, a common weighbridge, workshops, &c. There were also advantages on the administrative side, because the Directors, the managing staff, clerks, collectors, canvassers, mechanics, storekeepers, and so on, would be able to attend to the two organizations.

With regard to the statement made by Mr. Tyldesley Jones that there was scope for the use of all the power that could be generated from waste heat at the gas-works themselves, witness said that the Horley Works were small, and a works of that size did not employ power to anything like the extent that a large works would. For instance, at Horley there were no stoking machines or coal and coke handling plant, and this was a general state of affairs in works of that size. In a small works the waste heat would be available for external purposes, and in a large works a great deal of it could be used for internal purposes. As to the condition of the Horley Works, it was a very fair average for works of that size; he had inspected the works, and had seen nothing which he would have condemned. The amount of waste heat at Horley was about the same as would be found at other works of that size. In the winter months there was an amount of waste heat which should generate something over 900 lbs. of steam per hour. The temperature of the waste gases at the point where they would enter the waste-heat boiler was something over 500° C. Answering further questions on the point of competition, he said it was not good for the consumers in a small district such as Horley. Elsewhere it was, up to a point; there were advantages on both sides.

Mr. Tyldesley Jones suggested that, before electricity was used for lighting, there was no attempt by the gas companies to substitute the incandescent burner for the old flat-flame burner, and said that it was after the introduction of electric lighting, and in consequence of competition, that the improved methods in the gas industry were introduced.

Witness had his doubts.

Counsel said that, whatever might be the future policy of the gas and electrical industries, whatever combinations might come about, the consumer had benefited very materially indeed from the competition which had of late years existed between gas and electricity; and, had it not been for the advent of electricity, the gas industry might not have been in the proud position it occupied to-day.

Witness would not go so far as that.

Counsel, with regard to the utilization of waste heat in small gas-works, said that there were installed in small works to-day, by up-to-date gas engineers, many of the appliances which witness had said were only used in large works.

Witness said there was a sprinkling of small works in which there were mechanical stokers, for instance, and agreed that there was a tendency to apply more and more labour-saving appliances in small works.

Counsel suggested that the reason why there were many small works which had not these appliances was that those works were out-of-date. Other plants which he suggested could utilize waste heat were the sulphate plant and water gas plant. He then asked whether witness knew of a single works of the size of the Horley Works where there was a surplus of waste heat beyond what was wanted for a waste-heat plant.

Witness said it was much better practice for a works of that size to go on supplying its steam from its present boiler plant, and to use the waste heat for the production of electricity. In this way they could use up the coke breeze and the fuel extracted from the furnace ashes for producing steam. It was better to make steam with that fuel than to try to sell it. If they were to shut-down the old boiler plant at Horley, and run the works with the steam generated by a waste-heat boiler, he did not think they would use it all. Asked what proportion there would be available, he said there would probably

be half of it. Waste-heat boilers, he said, were comparatively new. Asked if it would be fair to say that in the last five or six years it was proper gas engineering practice to adopt them wherever possible, he replied that it was so in the larger works, but not in smaller ones in all cases. If electricity were not generated by steam from waste heat at the Horley Works, he admitted that it might be a good thing to utilize waste heat for the works purposes.

Counsel then suggested that the water gas plant, if worked in this way, would require 50 p.c. of the whole production of heat.

Witness said he had not worked this out. In re-examination, he stated that 900 lbs. of steam per hour could be generated from waste heat when the amount of coal carbonized was 18 tons per day.

Mr. Hugh Seabrook's Evidence.

Mr. *A. Hugh Seabrook* (Sir Charles Bright & Partners, Ltd., Electrical Engineers, and late General Manager and Chief Engineer to the St. Marylebone and West Ham electricity supply undertakings) gave evidence as to the electrical scheme, which had been prepared by Mr. F. A. Greene (Consulting Electrical Engineer), and which he himself approved. In the first instance, he said, he was retained, in conjunction with Mr. Gill, for the purpose of advising the Company solely on the question of the utilization of waste heat for the generation of electricity. The difficulty they were confronted with was that the recovery of gas-works "surplus" heat (this was a better term than "waste" heat) was comparatively new, and very few engineers had had the advantage of being associated with the work. There were a number of eminent engineers to-day who would more or less scoff at the suggestion that gas-works produced surplus heat which would be of any use whatever for the production of electrical energy. It had been referred to by some well-known men as a "stunt"; but he wanted the Committee to realize that it was very far from being a stunt. The experience of one gas company had induced them to extend largely the principle of surplus heat recovery. Two or three other works of the company were now being equipped with this plant, and their biggest works were putting-down a 2000-kw. plant; the whole of the steam used being produced by surplus-heat boilers. At present, the company in question were considering the cost of converting the surplus heat, and of disposing of it to outside users of electricity. One or two big undertakings had experimented, and were prepared to spend a considerable capital sum in proving the idea. The small undertakings, naturally, had not the financial resources, and had to wait for the results obtained by others. There was no question that the recovery of surplus heat had been carried out with marked success. At present it was being recovered chiefly from the carbonizing process, but it was being examined in other directions, and, in fact, a Continental engineering firm would now put down plant and guarantee the results, utilizing another form of surplus heat in gas-works—namely, the heat generated by coke quenching. Much valuable heat could be recovered from this additional source, which, so far as this country was concerned, had not even been touched. The firm mentioned was Messrs. Sulzer Bros., of Germany. Another important aspect of this question was that it worked towards the conservation of coal. One large gas company would be able to release about 100,000 tons of coke breeze per annum, which was now being used on their boilers. This 100,000 tons of coke breeze would be available, when the plant was completed, for use by other fuel-consuming companies. It was a simple matter to deduce roughly the result if this heat recovery were applied to every gas undertaking throughout the country. Coming to the Horley Gas Company's electricity scheme, witness handed in a table giving the estimated results of the first two financial years' working. It had been decided to instal alternating current at 240 volts, single phase. In a place such as Horley, single phase would be cheaper and better than three-phase, the latter being more suitable where there was a demand for power. In Horley the proposition was a thin one for the first few years, but it was hoped that it would develop. In the first year he estimated that the units generated would be 70,000, and the units sold, 53,000; losses in transmission accounting for the difference. The maximum demand expected was 50 kw., the load factor 12 p.c., and the number of consumers 150. The Gas Company, having been in the neighbourhood for 30 or 40 years, were more likely to get consumers than were a new concern, because they had local influence and valuable knowledge. The gross income from current and meter rents was estimated at £1965, and the average price obtained per unit 8·6d. (10d. for lighting and 3d. for power). The expenditure, for generation, depreciation, rents, rates, and taxes, management and administration, was estimated at £1433, or 6·5od. per unit. During the first year, three-quarters of the units supplied could be produced from an engine run by the surplus heat plant, and the remaining quarter by an internal combustion engine, gas or oil driven. Thus the fuel costs to the Company would be reduced by three-quarters, whereas a separate company would have to use fuel to generate the whole. The cost of actual generation was £373 for the 70,000 units, £300 of that representing cost of wages, repairs, and maintenance, and the £73 representing the cost of the fuel to generate one-quarter of the output (17,500 units), at 1d. per unit. The net profit for the year was estimated at £532. In the second year he estimated 110,000 units generated, and 87,000 sold; the maximum demand being 75 kw., the load factor 13·5 p.c., and the number of consumers 200. This represented a normal increase. Only two-thirds of the units generated would be produced by waste heat, and one-third would be produced by fuel. The income was estimated at £2820 for current and meter rents; the average price obtained for current being 7·5d. per unit. As to generation, the wages, maintenance, and repairs would amount to £400, and the cost of fuel for one-third of the output, £152, making £552. The total expenditure would be £1852, equal to 5·13d. per unit; leaving a net profit of £968. It had been found, said witness, that where gas and electricity supplies were combined, the gas consumption increased rather more rapidly than previously, though there was apparently no competition. It was difficult to explain why, but it was a fact. He had assumed that in the second year of the electricity supply the amount of waste heat available from the gas-works would be the same as in the first year, but if the consumption of gas increased, the amount of waste heat would increase, and the Company would be able to generate more than two-thirds of the output of electricity by the utilization of this heat. As to capital expenditure, the amount on generating plant in the first year, including surplus-heat recovery plant, would be £4770, and the expenditure on mains £8813, making a total of £13,583. In the second year the capital expenditure would have reached £6270 on plant, and £10,000 on mains, making £16,270. With regard to the suggestion that the Gas Company sought electricity powers in order to prevent competition with the gas undertaking, he said this had not been substantiated. He had been associated with two gas companies who had promoted electricity Bills. These Bills received Royal Assent in August, 1923, and in both cases the generating stations were opened by August, 1924. There was no object in spending a lot of money and letting it lie idle. He looked at the matter purely from the commercial point of view, and was not prejudiced.

Mr. Tyldesley Jones, cross-examining, referred to a paper read by Mr. Seabrook before the London and Southern Junior Gas Association on this subject, on Jan. 27, 1922 (see "Journal" for Feb. 1, 1922, p. 259), in which he had said "My proposal to combine gas and electricity stations can easily be damned by the engineer, gas or electrical, who does not like the idea." Counsel suggested there had been a good deal of damnation of the idea, and witness agreed. In the reply to the discussion, witness had said that Mr. S. B. Chandler (of the South Suburban Gas Company) had touched on the weakest spot in the whole thing—that was the danger of what the Americans called "combination in restraint of trade." Thus even the witness had to admit that, delightful as was the idea from the point of view of the engineer, there was a weakness in that combination possibly in restraint of trade.

Having ascertained from witness that the only power uses which he had in mind at Horley when arriving at his estimates were domestic, Counsel asked if there were any laundries in the district, and suggested that they were good customers for electric power. Witness replied that he believed he had seen one laundry, but considered 3d. per unit too high to be attractive in that case. Counsel thereupon suggested that the Company might cut the price for power very fine, in order to secure a power load, and then secure the lighting of the laundry; but witness regarded that as an unbusinesslike proceeding. Counsel pointed out that witness had taken charge of the St. Marylebone Borough Council's electricity supply undertaking at a time when it was saddled with a big debt, but had built-up the business and made it a paying concern, and had had to cut prices very fine for some years in order to do this. Witness agreed, but said that one must take into account the difference in the kind of residents in St. Marylebone and Horley. He agreed that it was his experience that in districts such as Horley, where many houses had their own electric generating plant, those plants were shut-down as soon as a public supply of electricity became available.

With regard to the estimated cost of generation, Counsel pointed out that, though it was intended to take away from the gas undertaking for the purposes of the electricity undertaking the waste heat which, if used in the gas-works, would reduce the cost of making gas, nothing had been allowed the gas undertaking in this respect. Witness replied that the gas undertaking would not be really any worse off by the utilization of the heat, which was at present waste. There was a good deal of rubbish in the way of fuel generally used in gas-works boilers for the production of the small amount of steam required; and in a case such as the Horley undertaking that fuel could not be disposed of otherwise. The average small gas company found that the steam raised by the use of this waste fuel was sufficient for their purposes, and they did not recover surplus heat, because, until they were able to supply electricity, they had no use for it. No one in his senses would instal mechanical conveyors and machinery of that type in a works of this size.

Discussing stand-by plant, Counsel asked what happened if the 50 kw. alternator to be installed broke down. Witness replied that if it broke down outside the winter months it would not have any effect on the supply, but if it broke down completely in the winter months he would have to replace it, and the demand could not be met in the meantime. He had allowed for all the plant usually installed in a small undertaking, where they could not afford to duplicate expensive plant. Counsel asked if it were not an absolute axiom of all electrical engineers that they must have, as spare plant, a unit of the size of the largest unit. Witness did not agree in the case of small stations, but in important stations it was so. In small stations they had to run certain risks. Counsel retorted that that was not very cheery for his clients, who were residents of Horley.

With regard to capital expenditure, Counsel ascertained that, though part of the gas-works site would be used for the erection of the generating station, no allowance had been debited to the electricity undertaking in respect of this. Witness did not see anything wrong in this, and, when asked whether the gas undertaking could not sell that land if it did not intend to use it for gas-works purposes, he said that it was of no value in the middle of a gas-works site, and could not be sold. Counsel said that, when the generating station was being erected, the coke store would be farther from the gas-works, and the cost of transporting it would be greater for the gas undertaking; but witness thought that this would make no appreciable difference. Counsel, examining a plan which he had not seen before, said the site was overcrowded, and that there was not sufficient space even now to devote to the development of the gas-works. Witness differed. The site comprised two acres.

Finally, Counsel pointed out that nothing had been allowed in the estimates put in for the costs of the present Bill, and wondered whether that was to be debited to the gas undertaking.

Re-examined, witness said that if an undertaking were overloaded financially by the installation of spare plant to ensure against every possible accident, it was not business. The combination of electricity undertakings with existing gas undertakings was the only way in which to get electricity into districts with a small population, and, at the same time, to produce reasonable remuneration on the capital. There were a number of small electricity companies which had never paid a dividend, and were not likely to, and it was not sound to put money into a business if it were not going to earn money.

Major *D. Napier-Whittingham* (Acting Managing Director of the Sussex Electricity Supply Company, Ltd.) gave evidence to the effect that his Company were desirous of obtaining a bulk supply of elec-

tricity from the Horley Gas Company, because, if it were not obtainable, they would themselves have to expend considerable capital on new plant.

Cross-examined by Mr. Tyldesley Jones, who suggested that it would not matter whether the bulk supply came from the Gas Company or from the Horley Electricity Company, witness said he would prefer it from a long-established Company which he knew to be sound financially. He did not reply when asked whether he would like it from an undertaking which would have to shut-down if an engine broke down.

Monday, March 23.

Mr. *H. J. Randall* (a Director of the Horley District Gas Company, and Engineer and Manager of the Yorktown and Blackwater Gas and Electricity Company) in evidence said that in the autumn of 1922 the Directors of the Horley Gas Company were considering the question of getting electricity powers, and in November of that year had written to the Gas Companies' Protection Association for advice. The Secretary of the Association had advised them that the two courses open to them were to promote a late Bill in Parliament in the 1923 session, or for the Directors to promote a Special Order under the Electric Lighting Acts, with a view ultimately to transferring the powers to the Company when they got the necessary sanction from Parliament. They had at first decided to adopt the second course, but, on the advice of their solicitors, had ultimately deferred action, owing to the possibility of the passage of the Bill introduced by Mr. R. G. Clarry, M.P., to give statutory gas companies facilities for obtaining electric supply Orders from the Electricity Commissioners, instead of having to go to Parliament for power. He corroborated the statement made by Sir Harry Courthope-Munroe with regard to the events leading up to the promotion of the present Bill. He considered that a gas company, under ordinary conditions, should be able to distribute electricity in an economic way, and pointed to the economies arising from the combination of the two undertakings. This was particularly the case in such a district as Horley, where the greater part of the load was for lighting, and was almost negligible in the summer. The idea of using waste-heat plant for generating electricity was that, through the hours of the night, after the load had dropped, and also during the day when there was not a large demand, the waste-heat plant could be used, and when the demand increased, the auxiliary gas or oil driven plant would be used. Dealing with the experience of the Yorktown and Blackwater Gas and Electricity Company, he said that the demand for electricity had increased steadily since 1921, and the gas load had also increased. His figures showed that in 1922 the Company had sold 23,701 units, and in 1924, 75,970. In 1922 and 1923 they had cleared costs, and in 1924 had made a profit of 5 p.ct., after allowing for 5 p.ct. depreciation. In 1921 the output of gas was 132 million c.ft., and at the end of 1924 it had increased to 159 millions.

Statistics were then given as to the progress of the gas undertaking at Horley between 1913 and 1924. The mileage of mains had increased by 31·6 p.ct.; the number of consumers by 49·7 p.ct.; the sale of gas by 76·6 p.ct.; the prepayment meters in use by 61·3 p.ct.; the ordinary meters by 30·8 p.ct.; stoves by 168·4 p.ct. The gas sold in 1913 was 38,705,300 c.ft., and in 1924, 68,363,100 c.ft. The price of gas in 1913 was 4s. per 1000 c.ft., and the average price in 1924 was equivalent to 5s. 8¼d.

As to the suggestion made by the Electricity Company at Horley that stoking machinery might be installed at the Horley gas-works, witness said that at Horley there were gaseous-fired horizontal retort settings on the regenerative principle, single-ended. It would not be economical to instal machinery for dealing with the number of retorts in use there, nor would it be economical to instal plant to utilize waste heat for the purposes of the works, because steam was generated at present by breeze, for which no market was available. Even if there were no waste heat available at Horley, he would still advocate the generation and supply of electricity there by the Gas Company.

Mr. Tyldesley Jones, cross-examining, said that the people of Horley had been agitating for a supply of electricity for years, but no effort had been made by the Gas Company to give it.

Witness would not agree that the supply had been needed for years.

Counsel suggested that in October, 1922, when the Gas Company had first decided to seek powers to supply electricity, there was a local agitation for a supply, and that it was because of this that the Company had decided to seek powers.

Witness denied this. He maintained that the question had been under consideration by the Gas Company before that time.

In the course of further discussion, Counsel examined the minute book of the Company, to show that there was no minute indicating that the matter had been discussed prior to the holding of a meeting of local residents with a view to forming an electricity supply company. He also referred to the letter from the Secretary of the Gas Companies' Protection Association to the Horley Company, in order to substantiate this. Counsel went on to explain that the first scheme prepared on behalf of the residents was rejected by them, and negotiations were opened with another firm, in London, with regard to preparing another scheme. In February, 1923, a notice had been published by the Gas Company in a local paper to the effect that application had been made by them for power to supply electricity, and he obtained the admission from witness that this was not correct, because application had not been made. Counsel also pointed out that nothing had been done by the Gas Company from February, 1923, until June, 1924, when they had resolved to apply for powers, but at that time another public meeting was held at Horley, at which it was decided to form a company to supply electricity. His suggestion was that the Gas Company would have done nothing but for the action of the local residents. He also said that in September, 1924, a letter was sent to the Secretary of the new Company informing him of the steps taken by the Gas Company, while a similar letter was also sent to the local Press, with a view, he suggested, to preventing the continuance of the new Company. Witness replied that the letter was written to the Secretary of the Company simply for the purpose of making him acquainted with what was going on. The prospectus of the new Company was out by that time, and Counsel suggested that the letter to the local Press was an attempt to stop people from subscribing. Notwithstanding this, over £10,000 had been subscribed by local people. Witness did not know whether those subscribers were local people.

Reference was then made to the development of the gas undertaking, and Counsel referred to a number of areas in which the Company had had powers to supply since 1886, but had not yet given a supply. In these areas there were important clusters of houses which ought to be supplied. Witness said that these areas were situated at some distance from the works, and were rural in character, and that to supply them was not a commercial proposition at the moment.

Replying to further questions, witness said that the Horley Gas Company had approached the London and Brighton Section of the Southern Railway with regard to obtaining a bulk supply of electricity, and the Railway Company had replied that they were prepared to consider it if the Brighton line were electrified. Electrification, however, was too far off.

With regard to the prices charged for gas at Horley from 1913 onwards, Counsel ascertained from witness that the candlepower of the gas supplied in 1913 was 15⅝, which was equivalent to more than 600 B.Th.U. per c.ft. In 1924 the prescribed calorific value was 475 B.Th.U. per c.ft., so that, in order to get the same heating power in 1924 as in 1913, a larger volume of gas had to be used. Thus, said Counsel, if the calorific value of the gas supplied to-day were the same as in 1913, the price per thousand c.ft. would be 7s. 2d. instead of 5s. 8d., and the former figure had to be compared with the pre-war figure of 4s.

With regard to the statement made at the beginning of the proceedings, that 21 gas companies had been granted electricity supply powers, he said that, of those, six had had their powers revoked; two had transferred their electricity powers to other bodies; one had transferred its gas powers to another body; and in one case no supply was given at all. Thus, in twelve cases a supply was being given, and in one of these the Company had no gas powers, so that there were only eleven companies supplying both gas and electricity.

With regard to statements made previously, to the effect that coke breeze was used at the Horley Gas-Works to generate steam, and that there was no market for it if it were not so used, Counsel exhibited the accounts of the Company for the last three half-years, which showed the amount of breeze used at the works and the amount sold, there being none in store at the end of each half-year. This indicated, he said, that there was a local market for breeze.

In re-examination, witness said that he had introduced the question of supplying electricity when he had joined the Company in 1922, and at that time he knew nothing of the attempts made by other people in the district to form a company.

Mr. *Alexander Horn* (member of the Reigate Rural District Council) said he was of opinion that Horley would get a supply of electricity more quickly if it were in the hands of the Gas Company than if it were in the hands of the new Electricity Company. It was also more convenient to the consumers to deal with one Company for the supply of the two commodities than to have two separate companies. It was not correct to say that the Rural District Council were supporting the new Company. The attitude of the Council was to take neither one side nor the other. When a resolution was moved in regard to the Electricity Company's application for powers, the mover had said that he did not ask so much for the consent of the Council, but simply that the Council would raise no objection.

Mr. Tyldesley Jones said he had been told by an official of the Ministry of Health that the Ministry had a formal resolution, sealed by the Rural District Council, giving their consent.

This concluded the case for the promoters.

Mr. Tyldesley Jones, addressing the Committee on behalf of the Electricity Company, said that that Company was formed by local residents for the purpose of supplying electricity in their town, and the fate of the present Bill was of great importance to them. They had subscribed over £10,000, and were prepared to spend more for the purpose of inaugurating a supply, and had had an expensive Parliamentary fight thrust upon them by the action of the Gas Company. Horley should have had a supply long ago; it was bigger than the adjoining district of Crawley, which had had a supply since 1908. The Gas Company had had its hand on this area since 1886, and, with the exception of a very small part, had not supplied gas within it. With regard to the events leading up to the promotion of the Bill, he said the facts were that the Gas Company first decided to ask for electrical powers after the local agitation in 1922, and that the Gas Company had acted in order to defeat this agitation. The first scheme prepared at the instance of the local residents was turned-down in February, 1923. It was in that month that the Gas Company had published a notice in the local paper to the effect that application had been made by them for powers; but this statement was untrue. From that time until June, 1924, the Gas Company did nothing. Then another public meeting was held by the residents. Thus, their first movement, in 1922, synchronized with the local agitation, and the second move, in June, 1924, synchronized with the next public meeting. In the meantime, those local residents concerned with the previous scheme had been negotiating with a London firm with regard to a more suitable scheme; and the negotiations had occupied them up to June, 1924. While the matter was being conducted privately, and the Gas Company knew nothing about it, the latter were quiescent; but when canvassing began, and the matter became known, they wakened up again. It had been said that the Gas Company had delayed, owing to the presentation of a Bill to Parliament to give statutory gas undertakings means of obtaining Orders from the Electricity Commissioners. This Bill, however, was not introduced until May, 1924, and did not explain the delay in 1923. It was thought that one of the best ways to kill the Electricity Company's scheme was to deprive it of money by warning the public not to subscribe, but, notwithstanding the information that the Gas Company proposed to promote a Bill, the public put down the money. If the minimum amount had not been subscribed, he doubted whether the present Bill would have been promoted. An engineer from the Electricity Commissioners had visited the locality and had held an inquiry. A site had been secured adjoining the railway, and objection had been raised with regard to the site; but whoever had engineered that opposition had failed, and the Commissioners had granted an

Order. The initiative in this case was with the Electricity Company. With regard to the question of competition between gas and electricity, he said there ought to be healthy competition; there was no question that the consumers benefited thereby, and it was due to the electrical competition that the gas industry had made the strides it had. It was all the more necessary in small areas such as Horley, where gas companies were apt to be a little slack, unless they had a rival to keep them up to the mark. The expedients that had been used by Mr. Seabrook at St. Marylebone, in order to develop the electricity undertaking there, would not be used by a Company who, if they obtained the electricity load, lost the gas load. There could not be competition between gas and electricity where they were supplied by the one concern.

The Committee then adjourned.

POOLE HARBOUR BILL.

This Bill, which was before a Committee of the House of Lords presided over by the Marquess of Bath, K.G., C.B., on March 23 and 24, was opposed, among other petitioners, by the Bournemouth Gas and Water Company. The main point of the Gas Company's opposition was that they desired power to nominate a representative on the Harbour Board.

Mr. Rowand Harker and Mr. H. F. Bidder appeared for the promoters, and Mr. Arthur Moon for the Gas Company.

Mr. Rowand Harker, opening the Bill, said that its objects were to obtain power to increase the maximum rates of dues and charges by 100 p.ct., to obtain powers as to the remission of certain parts of the boomage rates on vessels of certain classes, as to rebates on boomage rates, and as to qualification for membership on the Board of the Commissioners. The Gas Company did not object to the increase of maximum rates by 100 p.ct., but asked that they should be subject from time to time to revision by the Minister of Transport. They objected to the provision with regard to rebates on boomage rates, and asked for the statutory right to nominate one member on the Board, so that the number of Commissioners would be increased from 18 to 19. The Harbour Commissioners regarded the suggestion as a matter of principle of some importance. The Gas Company apparently claimed that right because at the present time they were the body who paid the largest sums in dues and rates, which statement was perfectly accurate. But it might well be that the time would come when some other body or company would be paying as much or even more than the Gas Company. As a matter of fact, the General Manager of the Company was at present on the Board, and any particular matter which the Gas Company might wish to urge before the Board could be urged by him. But, on principle, the Commissioners asked the Committee not to say that any company, whether statutory or otherwise, should be entitled to nominate a member. It might be suggested that there was a precedent for doing this in the fact that the Southern Railway Company had the right to nominate a member; but the distinction between a railway company and a gas company was, in his submission, obvious. The Southern Railway Company were vitally interested in the welfare of the port from many points of view; and this, no doubt, was the reason which had influenced the Board of Trade in giving them representation.

With regard to the revision of prices, it was suggested by the Minister of Transport that he should have power to revise the maximum charges, whereas at present the Board of Trade had power to revise the actual charges.

Mr. *William Cash* (Chairman of the Bournemouth Gas and Water Company), in evidence, said that the Company were in no sense antagonistic to the Harbour Commissioners, and realized that the interests of the Company and of the Harbour Commissioners were identical. He supported the proposed increase of rates by 100 p.ct., though the Gas Company paid, in fact, about 40 p.ct. of the total income. It was felt that the Commissioners were well advised in making expenditure on the harbour; and if it were necessary to raise the rates, he had no objection. Owing to the large proportion of the rates and dues the Company paid, it was not unreasonable that they should be allowed to nominate a member of the Commission. The Company had a very large interest in the port, and had always worked harmoniously with the Commissioners, but their interests did not always coincide with those of other traders, and, therefore, they would like a representative. It was true that the traders had elected the General Manager of the Company as a Commissioner, but this was only on votes, and the voting lay in comparatively few hands. The Company had only a limited number of votes.

Mr. Arthur Moon, addressing the Committee, said that the position was that the Company, though they supported the application for an increase of rates, considered it ought to be made a condition of allowing the increase that they who chiefly paid that increase should have a representative on the Board. It was the only way to ensure fairness, because otherwise they depended upon the good wishes of the other electors. It was obvious that the time might come when the other persons who had a vote would have different interests from those of the Gas Company. At present the private wharves had 35 votes, and they paid £1400 in dues; the Gas Company had 6 votes, and paid £2500 in dues; other traders had 70 votes, and paid £2100.

There was some discussion as to whether the Committee had the right to alter the constitution of the Harbour Commission. If it were wrong for the Committee to give the Gas Company representation on technical grounds, said Mr. Moon, then the Harbour Board could never be altered unless the harbour authorities wanted to alter it. This would be a farcical result, and he did not think there could be any question that the Committee had absolute power to alter the constitution. From the point of view of voting alone, it seemed that it was not only fair to the Company, but desirable in the interests of the harbour, that the Company should have a permanent representative on the Board. But, in the case of a public utility Company, who were there partly for the benefit of the public, and a Company who had spent money on the public works of the harbour, and a large sum on providing private appliances for loading and unloading their coal, they should be all the more entitled to representation. He was willing, if the Committee considered it fair, that this right should only continue so long as the Company paid a certain proportion of the dues, the proportion to be fixed by the Committee; but he submitted that this limitation was unnecessary. He also said that the Bill would be a better one if the clause giving the Minister of Transport power to revise maximum charges were inserted.

Mr. Rowand Harker contended that if the Committee gave representation to the Gas Company, he did not see how, in principle, it could possibly be resisted in the case of any other undertaker who paid substantial sums. But there was also the question as to whether it was possible to alter the constitution without placing the whole Bill in jeopardy, on technical grounds. Apart from this, the promoters might be met in the other House by petitioners objecting to the alteration.

The Committee decided to allow the Bill to proceed, subject to the inclusion of the revision clause suggested by the Minister of Transport.

THE ELECTRICAL INDUSTRY AND THE SLIDING-SCALE.

The various electricity Bills which embody the agreement with the London County Council for the postponement of the purchase rights of the Council from 1931 to 1971 are now receiving the attention of a Select Committee of the House of Commons presided over by Sir Arthur Shirley Benn. These Bills, it may be recalled, have been suspended since last summer owing to obstructive tactics in the House during the latter part of last session, when the Labour Government was in power; but they have been carried over until this session, having already passed through the House of Lords. At the beginning of this session there were four Bills; but one of them, the County of London Electric Supply Company's Bill, which proposed to take in practically the whole of Essex as a power area, has fallen by the way, having been rejected by the present Government on second reading. There thus remain three measures which have an important bearing upon the scheme for co-ordinating electric supply in the London and greater London area by the Electricity Commissioners. One of them is promoted by what has come to be known as the Ten West-End Companies, and the other is promoted by the remaining four companies which deal with the City and adjacent areas. Both these measures embody an agreement with the London County Council for the postponement of its purchase powers until 1971, at which time the undertakings will be handed over to a Joint Electricity Authority, yet to be constituted, free of charge. The third Bill is by the North Metropolitan Electric Power Company, which also has some bearing—though not such an important one as the other two Bills—on the scheme for supply in the London and greater London area.

With the general details of these schemes we are, of course, not specially concerned; but one point has arisen during the course of their consideration which is of a little interest—namely, the application of the sliding-scale to the electric supply companies in London under the agreement with the London County Council with the acquiescence of the Electricity Commissioners. Here again we are not concerned so much with details as with the principle, and even so only by reason of the fact that the gas industry has been "prayed in aid," an expression lawyers are rather fond of in bringing the matter to the notice of the Committee. The particular form of sliding-scale proposed is one in which the companies are given a minimum dividend and a standard price, so that the slide only operates in one way—namely, in the upward direction. In other words, the company can increase its standard dividend by reductions in price to the consumer, but if at any time it is necessary to increase the price to the consumer, the dividend never falls below a fixed minimum. This is the same principle as has been applied to several gas undertakings since the war, with the object of making it easier for them to raise capital.

During the course of the proceedings on the first of the series of Bills now under consideration, the City of London Corporation have strongly opposed; and their Counsel, Sir Lynden Macassey, K.C., has endeavoured to stress the point that the bargain in this respect is not in the public interest. He made considerable play with the fact that last year, in connection with the Rhymney Gas Bill, evidence was given by Mr. Honey, of the Board of Trade, to the effect that the Board do not now favour the sliding-scale which operates only in the upward direction.

The Chairman of the Committee at one stage interpolated the remark that the position in the gas industry would not influence the opinions of the Committee in connection with these Bills, as the circumstances were so totally different.

Sir Lynden Macassey, however, pressed the point, and contended that Parliament have for all practical purposes abandoned the new form of sliding-scale, and that to ask the Committee to impose this same form of sliding-scale upon the electrical industry—and moreover, the first time that a sliding-scale had been applied to this industry—required very serious consideration, and he would not be doing his duty to his clients if he did not bring the facts before the notice of the Committee.

Later on in the proceedings, Mr. William Cash, who has advised the London County Council in this matter, argued that, in the special circumstances of the London electricity supply problem, he considered that the financial scheme in the agreement with the London County Council, which involves the new form of sliding-scale, is fair and justifiable. Incidentally he mentioned that he would prefer the old sliding-scale, at any rate for large concerns, because, though the ordinary sliding-scale did militate against the issue of new capital by small undertakings, he was not at all sure that the new form was an advantage when it came to big capital issues. He pointed out to the Committee, however, that, in the case of the Rhymney Gas Bill, the Chairman of the Committee which considered it, after hearing Mr. Honey's evidence, gave the decision that he did not rule out the principle of the new sliding-scale, but that the Committee did not think it wise to apply it in the particular circumstances of the Rhymney Company.

LEGAL INTELLIGENCE.

DAMAGES FOR BREACH OF CONTRACT.

On Monday, the 23rd ult., the case of the *Dursley Gas Light and Coke Company, Ltd., v. Low-Temperature Carbonization, Ltd.*, came before Mr. Justice Greer in the King's Bench Division.

Mr. E. A. Digby, who appeared for the plaintiffs, said they had received a letter from the defendants' solicitors, dated March 20, stating that the case would not be defended. The action was brought to recover £7 10s. a day from Jan. 1, or a total of £357 10s. The claim arose in this way: On Jan. 16, 1924, the plaintiffs entered into a contract with the defendants by which the former were to lease to the latter a piece of land on which the defendants were to erect a number of retorts. The gas was to be supplied within three months of the lease being granted. The retorts ought to have been erected some time ago, but nothing had been done up to the present. The plaintiffs had suffered considerable loss through the default, as they had entered into other contracts on the faith of the defendants carrying out theirs.

Dr. *Adams*, the Chairman of the Gas Company, said he had personal knowledge of all the transactions with the defendants. Nothing had been done by the defendants under the contract, and in consequence his Company were suffering severe loss.

His Lordship entered judgment for the plaintiffs for £357 10s., with costs.

AN OXYGEN DISPUTE.

On Wednesday, March 25, the case of the *British Oxygen Company, Ltd., v. Liquid Air, Ltd.*, came before Mr. Justice Romer upon motion for an injunction to restrain defendants until trial or further order from publishing, printing, or circulating a letter of Dec. 17, 1924, addressed by the plaintiffs' Lancashire district agent to Tanks & Drums, Ltd., of Bradford, in which he set out the terms on which the plaintiffs were willing to supply oxygen to that Company, and from allowing the letter to be photographed, or copies and extracts made for the purpose of informing the public of its contents.

Mr. Upjohn, K.C., said the plaintiff Company was formed in 1886 to make and supply oxygen, and to make oxygen plant. Defendant Company was formed in 1913; the business being the manufacture of oxygen gas plant. Plaintiffs were in a large way of business, and had installations throughout the country, from which oxygen was supplied in cylinders. Among other customers were Tanks & Drums, Ltd. The defendant Company were minded to become their rivals in the sale of gas plant, so that purchasers could make their own oxygen. Among other firms, they approached Tanks & Drums, Ltd., who were old, and large, customers of the plaintiff Company; and the latter, not wishing to lose their business, instructed their Lancashire district manager to write offering a low quotation for oxygen, on condition that they took a certain quantity, and did not set up any plant to supply. The defendant Company's Manager heard of this letter, and having obtained a copy from the Manager of Tanks & Drums, Ltd., had it photographed. Copies were then forwarded to brokers and jobbers on the Stock Exchange, with a request that it should be shown to others who were interested in dealings in the shares of the plaintiff Company. The result was a fall in the price of the shares. The price quoted to Tanks & Drums, Ltd., was a special one, at which they could not offer to supply small customers; but the quotation had been used to convey the impression that the effect of the defendants' competition was such that the plaintiff Company had to reduce their price to one at which they could not possibly make a profit.

Sir H. Slesser, K.C., for defendants, denied that photographs of the letter had been shown on the Stock Exchange.

Mr. Upjohn, in answer to his Lordship, said he rested his case on copyright, and, next, that there had been a breach of confidence.

Sir H. Slesser submitted that the question at issue could not be properly tried on motion, but should be dealt with at the trial. For a long time the plaintiffs had tried to interfere with the defendants' business, so as to prevent their raising further capital and getting a quotation on the Stock Exchange. He contended that defendants were entitled to use the letter, to protect their own interests. The motion was, in his view, an abuse of the process of the copyright law.

After hearing the affidavits filed on both sides, the hearing was adjourned till the following day.

On Thursday,

Mr. Upjohn contended that the copyright of the letter being the plaintiffs', the defendants were clearly in the wrong in multiplying copies by means of photography.

Sir H. Slesser contended that the letter in question was not a literary work in any sense, but merely a commercial document in which there was no copyright within the meaning of the Act of 1911. But, assuming the letter was a literary work within the meaning of section 1, the defendants had only used it—as they were entitled to do—for the purpose of criticism, and to show how the plaintiffs were trying to injure the defendants' business. All they had done was to protect their own interests. The Court having a discretion in this class of case, he asked his Lordship to hold that, having regard to all the circumstances, the letter was not one which ought to have the protection of the law of copyright.

His Lordship reserved judgment.

Auckland (N.Z.) Gas Company, Ltd.—The profits for the year's working amount to £70,036, making, with the balance of £34,519, £113,555. The Directors recommend a dividend for the past half-year at the rate of 8 p.c. per annum on the £1 fully-paid shares, and proportionate amount on the contributing shares, 4s. paid. This will leave £37,457 to be carried forward.

MISCELLANEOUS NEWS.

JUBILEE OF THE MUNICIPAL GAS-WORKS AT THE HAGUE.

The following interesting particulars are extracted from an attractive brochure for which we are indebted to the courtesy of the Manager of the Hague Gas-Works, Mr. J. E. H. Bakhuis:

In 1844, when the competition of "portable" gas, supplied in iron casks, was still a thing to be feared, a concession for the supply of gas at the Hague through mains was granted to Mr. Neville Davison Goldsmid, who erected a plant in the Lijnbaan. The price originally charged was 24½ c. per cub.m., equivalent to about 11s. 6d. per 1000 c.ft. In 1875, this works was purchased by the Municipality for £43,000; but as the plant proved to be inadequate for the growing consumption, it was decided to build a new station in the Loosduinschen weg. The opening of this works in 1876 was followed, in 1879, by the shutting-down of the Lijnbaan Works, where the cost of production was considerably higher than at the more modern station. By 1886 the price of gas had been reduced to 7 c. per cub.m., equivalent to 3s. 3d. per 1000 c.ft.

Mr. J. E. H. Bakhuis, the present Chief Engineer, succeeded Mr. Kros as Manager in 1896. In 1905 the works in the Loosduinschen weg began to approach its maximum output of 150,000 cub.m. (approximately 5,300,000 c.ft.) per diem; and the Municipal Authorities—true to their policy of reducing the cost of production—therefore decided to construct yet another new works on the Trekvliet canal, which gives 500-ton barges direct access. The present daily output of this works (opened in 1907) averages 150,000 cub.m., the length of mains being 428 km., or about 265 miles, and the number of consumers 85,000. It is interesting to note that the leakage, which in 1875 amounted to 26·7 p.ct., is now only 2·67 p.ct., or exactly one-tenth of what it was fifty years ago.

The old works in the Loosduinschen weg was closed in 1924.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

Half-Yearly Meeting.

The Half-Yearly Meeting of the Company was held on March 25—Mr. F. J. Dickens presiding.

The Chairman, in moving the adoption of the report and accounts, said that two of the most satisfactory features in the accounts were: A further increase of 5¼ p.ct. in output, and the marked diminution in the quantity of unaccounted-for gas. The sales of gas in Dublin to-day were more than 60 p.ct. greater than they were immediately before the introduction of electricity. In the circumstances, it is strange to find there were still people who thought the days of gas were numbered. During the year they had secured 2212 new consumers, and 2778 new cooking and 860 further heating stoves had been sent out. The expenditure on manufacture of gas was approximately the same as the corresponding period—the actual figures being £150,157 in 1923, and £152,358 in 1924. As to the income obtained from residual products, the results were decidedly better than in 1923, as there had been an increase of no less than £15,436. The future outlook for the residual market, however, was not so good.

The total cost of distribution of gas was larger by nearly £4000. Most of the increase was due to the special examination of consumers' service pipes, which, as he had explained on a previous occasion, was being carried on with the object of giving, where possible, a more efficient supply, and, at the same time, tracing any leakage which might exist, so as to cut down to a minimum the loss under this head. In the repairs of meters account, there was an increase of something over £1700, by reason of the fact that a substantially larger number were repaired.

To sum up, expenditure for the half-year was down to the extent of £1347, while income was up by £1586, and thus they were enabled to carry into net revenue a profit larger by £2933. The balance of net revenue available, £60,068, would permit of a somewhat larger dividend being paid than that recommended, but the Directors felt convinced that 6¼ p.ct. should not be exceeded. As the reserve fund still required to be strengthened, and this could only be done out of divisible profits, an appropriation was recommended of £8275, which would bring it up to the round figure of £75,000, and the balance of £3296 would remain to be carried forward to the next account. The balance-sheet again disclosed a satisfactory state of affairs. The funds showed an increase of over £27,000, while liabilities to tradesmen and others had only slightly advanced. Stocks were heavier, and debtors had fallen by approximately the same amount. The value of investments was larger by £12,000.

Mr. Augustine Bird seconded the motion, which was passed.

The Chairman moved, and Mr. W. H. Davies seconded, the declaration of a dividend at 6¼ p.ct., less tax, on the consolidated ordinary stock of the Company. This was agreed to.

The Yorktown and Blackwater Gas Company.—The Company are holding two exhibitions this week. A complete and comprehensive display of "Richmond" cooking, heating, and water heating apparatus (which includes a series of their popular "Bungalow" cookers) has been tastefully arranged in the Woodcliffe Hall, Wargrave, and also (for the latter half of the week) at the Assembly Rooms, Twyford. Both of these new districts promise rapid development; and the Gas Company are to be congratulated on their initiative in running the necessary mains and in organizing these exhibitions to popularize the use of gas. An interesting series of cookery lectures and demonstrations is attracting a gratifying attendance; and special baking competitions for adults and children have aroused considerable interest in both districts.

RADIATION LIMITED.

At the Annual Meeting of the Company, held at the Queen's Hotel, Birmingham, on March 24, the Chairman, Mr. H James Yates, in moving the adoption of the report and accounts, said:

Radiation Policy.

It may perhaps be in the memory of some now present that when I first addressed you as Chairman of Radiation I outlined the policy which we proposed to follow. As I then stated, the object of bringing together the principal gas stove manufacturers of this country was to stop the waste occasioned by their vying with each other in useless expenditure; to "pool" the knowledge and capacity of the various companies; to concentrate more than ever on research work; to embody the results of that work in the types of apparatus we made; and, as far as possible, to standardize these types, so that all the component parts should be interchangeable—a matter which means so much to our largest customers, the gas undertakings, who maintain these stoves and stock the parts necessary for this purpose. The firms comprised in Radiation had always been in the van of progress; but it was felt that, by the uniting of their efforts, a much higher standard could be set—that we could produce better goods, increase the output, and give greater value for money. This policy we have ever since steadfastly pursued. High as the standard is which we set for our goods, and which we have attained, we are aiming to reach one still higher. The first cost of an apparatus to the purchaser is not necessarily the only consideration; but the higher the quality of that apparatus, the greater the satisfaction it gives to the user, and in the long run the less expense is required for keeping it in condition. It was our intention—and we have succeeded in translating that intention into accomplished fact—to make the "hall-mark" of Radiation upon any gas apparatus a guarantee that it is of the best quality attainable, and that it will give the longest service with the highest efficiency. We have also created the position that people who purchase Radiation apparatus appreciate that our services and advice are always available to anyone who requires them. To produce goods on such lines, and create such a position, naturally adds to cost; but though, consequently, our prices may not always be the lowest in cash amount, they actually are the lowest when their durability and also their economy in gas consumption are taken into account.

A Successful Year.

Our year's trading has been a successful one; but, like all other manufacturing concerns, we have had many difficulties to overcome. Our business has greatly increased, and as a result we have had to make extensions to our various works.

Our costs of production in some sections have risen; while in the case of others we have derived some benefit from our introduction of still further improvements which have reduced cost. Our object is continually to expand our business, and, as our costs come down, to give a full share of the benefit to our customers. The larger a business is, the less it "feels the draught" when times are bad; and for this reason it is far better to have a big turnover with a smaller margin of profit than a smaller turnover with a big margin of profit.

The Burden of Taxation

I shall not attempt to go into details regarding the position of British manufacturers in respect of export business. You are aware of the conditions that exist in other countries as compared with ours, and the exceptionally heavy taxation we have to bear. The handicaps against British manufacturers are both numerous and heavy. Last spring the then Chancellor of the Exchequer gave official figures as to the taxation per head of population—man, woman, and child—in this country and abroad. The taxation in this country was given as £15 18s. per head; in the United States, £6 14s. per head; and in Italy, £3 6s. 11d. per head. I learn that it has lately been officially stated in the House of Commons that the figure in France is about 441.5 frs., which works out at £5 11s. 5d. per head. The figure in Germany cannot be given with close accuracy, but a year ago I believe it was somewhere about £4. It was lately pointed out in the Press that the amount we are paying for income-tax includes 2s. 7½d. in the pound for war debts, of which amount 1s. 11d. in the pound is on account of the debts incurred by us in order to lend to our allies. While we are bearing this burden, our allies are relieved of their equivalent debt to us, and consequently relieved also of the taxation which they would have otherwise had to pay in order to liquidate these debts; so that this imposes on British manufacturers a crippling double handicap. If this heavy handicap of ours in the matter of taxation could be borne in mind by all classes of people in this country, they would realize more than ever the necessity for us to cut our own domestic expenditure—and consequently our taxation—down to the lowest limit, and to ensure the greatest output of all those things that we make for export, so as to bring down the cost.

Fuel Competition.

I believe that an essential condition of this country's future prosperity lies in the obtaining of cheaper fuel. It is necessary that we should have a larger output of coal, with a reduced cost, as fuel enters directly and indirectly into the cost of everything that is produced, including our food. Owing to the high cost of solid fuel, oil fuel is rapidly coming into use; and I believe we are going to see a great diminution in the use of solid fuel in the future. One has only to be on board a ship to realize the advantages of the use of oil fuel, even though it should cost the same as solid fuel. When a ship enters a port for fuelling purposes, in the case of oil, pipes are employed to convey it on board, and the filling of the tanks is conducted with speed and cleanliness, the least possible labour, and with no discomfort to the passengers; whereas with solid fuel the time and labour involved, and the dust and grime that fall to the lot of the vessel and the passengers, are things I need not enlarge upon. One cannot but reflect what a serious thing it would be for this country if these conditions were to lead to a general discontinuance of the use of solid fuel for shipping purposes; and the only way of avoiding this would appear to be for solid fuel to be so cheap as to prevent the general adoption of oil fuel by effective competition in price.

Our Imitators.

The progress of Radiation has been so striking as to involve us in one of the penalties of success—namely, that sincere form of flattery which lies in imitation; and our various apparatus have received a good deal of this attention for some time past—particularly so at present. Our own endeavour is to keep inventing and producing the best apparatus that experience and scientific research can evolve. We fully recognize that it is detrimental to our business that unsatisfactory apparatus should be offered by small makers. As an instance, take a gas-fire, which for long was looked upon with such prejudice, although fortunately this prejudice is now a thing almost wholly outgrown. If a gas-fire made by one of those makers finds a market on account of its price, and gives dissatisfaction to the user, the matter does not end there—the user condemns gas-fires as a whole, probably not knowing that there are perfectly satisfactory types to be had; and his bad opinion of them spreads.

The desirable thing in all interests is that all makers should produce gas-fires which give satisfaction. This would help the whole industry, as every gas-fire in use and giving satisfaction—no matter by whom it is made—will help to extend the general use of gas-fires. We want to see a healthy rivalry, not only in price, but in original inventions and improvements; but what we shall always denounce, and do everything in our power to prevent, is the producing and selling of imitations of those inventions which we have brought out at so great an expenditure of research, experience, and money. In recent times we have had to take legal measures against several imitators, not only in this country, but abroad; and in each instance the matter has been settled in our favour. There are still other important similar matters pending; and if the copyists are wise, they will realize that it is better for them to develop their own ideas rather than slavishly copy ours. Our motto is "Live and let live;" but it must be read to mean "Live at your own expense, and let us live at ours," although even then our work cannot but be helpful to others besides ourselves.

Research Work Development.

We are greatly extending and developing the research work of the Company. All along we have had in each of our works chemical and physical laboratories for research work, and in these we have also carried on regularly searching tests of all materials used in the construction of our apparatus, as well as the testing of all apparatus before it leaves the works. We are now constructing central research laboratories in London, on premises belonging to us and adjoining Radiation House. When these new central research laboratories are completed—which I hope will be in a month or two's time—they will constitute one of the finest and best-equipped research laboratories in the country, staffed by chemists of high scientific training, and of unrivalled special experience in all those branches of research with which our manufactures are concerned

While it is our intention primarily to devote all our energies to our own research work, we are cordial believers in co-operation and mutual assistance within the gas industry.

The "New World" and "New World Junior" Cookers.

In addressing you last year, I referred at some length to our new type of cookers, the "New World" and the "New World Junior," with the automatic heat-regulator called the "Regulo," which enables any person to use the oven with unerring certainty of success. This new type of cooker has completely transformed gas cooking. The cookers are not merely new patterns of apparatus, they are conceived upon new principles, only arrived at after years of research work and the expenditure of many thousands of pounds. The spontaneous encomiums they are constantly evoking is a great satisfaction to those of us who have been associated with the evolving of this type and the placing of it before the public. The new type has come to stay, and I regard it as among the most important assets of the Company. The reception of the "New World Junior" cooker affords every prospect of its realizing to the full our aim, that it should be—to repeat the "slogan" which I quoted to you last year—"A cooker for the million at a price for the million."

In passing, I must refer once more to the boiling burner in the hot-plate of these cookers which embodies a new principle, and which is called the "Rado." This type of burner has become the standard not only in this country but in our Colonies, and also, notwithstanding the difficulties of exchange and other obstacles, large numbers have been sold on the Continent and in various parts of the world. Imitators have done us the honour of copying this burner as near as they can; but they have still much to learn in order to produce a burner like the "Rado." The "Rado," to all intents and purposes, replaces the drilled-ring type of burner, as by its means the actual consumption of gas has been considerably reduced, and the combustion always remains complete; the burner cannot become clogged-up in use; and there is no risk of those unpleasant odours so often experienced in connection with the older types of gas cookers.

We spend a large amount in advertising our goods in the Daily Press and periodicals; but the benefit of much of our energy and outlay in this direction would be lost were it not for the enterprise of the gas undertakings, who, through their individual and organized efforts, make it so easy for householders to obtain and have fixed up any type of gas apparatus they may wish, with the least trouble and expense to themselves. Not only so, but the gas undertakings afterwards maintain a careful supervision of these apparatus in use.

"Thermo XX" Gas-Grates.

The sales of the Radiation "Thermo XX" injector-ventilator gas-grates last year have far exceeded all previous attainment. The injector-ventilator invention, as I have explained on a previous occasion, removes the last inequality of the gas fire as compared with the coal fire by giving ample ventilation of the room. It has no greater friend than the medical profession. At one time none con-

lemned the use of the former types of gas fires and grates more than the doctors; but since our creation of the modern hygienic, ventilating, and silent gas-grate, doctors are among the greatest gas-fire advocates.

The Smoke Problem.

The dense fogs experienced in this country during the present winter—and particularly in London—have directed renewed attention to what may be literally called "a burning question," and brought afresh before the public mind the important truth that it is not the factory smoke-stacks so much as the many thousands of domestic coal-fire chimneys which have so great a share of responsibility for these fogs. It is estimated that in London alone it costs a million pounds for each day that fog prevails. What it costs beyond this in sickness and impaired vitality due to the loss of the health-giving effects of sunlight is something far beyond calculation. It is coming more and more to be realized that sunlight is not merely a pleasant thing for the senses and a good thing for the life of plants, but that it is also a vital thing for the health of human beings. I hope the time is not far distant when legislation will be brought about to make it an offence to use any apparatus which helps to produce the "smoke-counterpane," as Carlyle would call it, which overspreads our country so much and so thickly. To burn solid fuel in its crude form in coal-grates is to do a grave injury to the community; and it is important to remember that when coal is burned in its crude form in an ordinary coal-grate, the direct waste of fuel is estimated at 5 p.ct., with a total loss of all the available bye-products, such as chemicals, disinfectants, oils, dyes, and many other things one could mention, which are so indispensable to us.

In telling you of the various matters connected with the Company's affairs, I have naturally dealt more particularly with the larger part of our business—namely, that which is concerned with the manufacture of gas apparatus and gas meters. Many of you, however, are aware that the business of our Company stands on a broad basis, and includes among its many activities a very extensive foundry business and a large enamelling business, and the goods made in our foundry business are extensively used in connection with all building schemes.

Education in Industry.

There is a subject to which I have referred on a number of occasions, and which I do not propose to enlarge upon now, but merely to mention in passing—namely, the educational scheme for the teaching of the economics of industry to workpeople, a scheme which I took a leading part in initiating some years ago through the National Alliance of Employers and Employed. Last year I gave some details of the growth of this educational scheme, and it has extended enormously during the past year. It has so established its position, and proved the value of its work, that it has now received full recognition from the Board of Education. Those of you who are associated with any kind of works, and who may not have already given opportunities for your workpeople and staff to avail themselves of this scheme of education, I strongly urge to write to your local office of the N.A.E.E., and obtain the necessary information. I can assure you that if you adopt this scheme, after you have had it in operation for some little time you will find your workpeople and staff more intelligently appreciating the difficulties met with in carrying on your business in these days; there will be a better understanding between them and yourselves; more co-operation; and a disposition to give a better output. The outlook of your employees will be improved, and so will your own, and there will be a happier and more contented feeling all round.

An Investors' Security.

When I first had the pleasure of addressing you as Chairman of Radiation, I said: "We want the Radiation shares to be recognized as an investors' security, and not as a speculators'; and it is the hope and aim of the Directors that Radiation should become known—by the steadiness of the Company's policy, and the absence of sensational occurrences in connection with the shares—as what I might call a gilt-edged industrial investment." I am referring to those remarks now in view of recent statements that have appeared in the Press and elsewhere. It is the policy of your Board to strengthen the internal affairs of the Company as far as it is humanly possible, so as to ensure against fluctuation in dividend and to be prepared for the "rainy days" which at some time or other come to all manufacturing concerns.

As I have mentioned earlier, we are determined to extend our business by every proper means at our disposal; and as we extend the business, so we hope to put ourselves in a position to produce at a lower cost. The time may come when it may be possible for us to increase our dividend; but in the opinion of your Directors no increased dividend should be paid until the financial resources of the Company have been put in a position to withstand any stress that might come upon them, and we do not consider that time has yet arrived. It does not follow because a concern has made a profit that they ought to distribute it by way of dividend. We have greatly extended our various works, including purchases of additional land; we have to carry much increased stocks; and, consequently, our debtors are also greatly increased. This is a heavy call upon the resources of any business. Also each year opens with its potential difficulties in prospect, and this year is no exception. In industrial concerns there is always an element of the unknown which has to be allowed for, and that is why we are anxious that the resources of the Company should be so strengthened as to be in an absolutely stable position, safe against all contingencies which could be reasonably anticipated.

No doubt you and I, or most of us, have at one time or another bought shares of different concerns on mere hearsay as to the possibility of certain things happening in these particular concerns; and we have done this with varying results. If anyone has been buying Radiation shares in the hope of an early increased dividend, I am sure they will not desire to blame anyone else because they have not obtained what they looked for.

I will conclude, gentlemen, by moving:

"That the report and balance-sheet for the year ended Dec. 31, 1924, as presented by the Directors, be approved and adopted."

The report and accounts were adopted.

GAS REGULATION ACT APPLICATIONS.

There have appeared in the "London Gazette" the following notices regarding applications to the Board of Trade under the Gas Regulation Act.

SPECIAL ORDERS

Aldershot Gas, Water, and District Lighting Company.

The Company give notice of their intention to apply to the Board of Trade for an Order under section 10 to enable them to raise further money, and to make provision with respect to the voting at meetings.

Colchester Gas Company.

The Company are seeking a Special Order to authorize them to raise additional capital, to make further regulations in connection with the supply of gas, and for other purposes.

DECLARATIONS OF CALORIFIC POWER.

Houghton-le-Spring District Gas Company.—480 B.Th.U. (July 1.)
Swindon United Gas Company.—425 B.Th.U. (July 1.)

NUNEATON GAS PRICES.

280 B.Th.U. Gas.

The Nuneaton Gas Company, towards the end of last year, gave notice to the consumers that the calorific value of the gas which they intended to supply, as from March 11, would be 280 B.Th.U. per c.ft. Also that from the date of the current reading of the meters and the March collection of prepayment meters, the prices of gas (gas only, and not including hire) would be as follows: Prepayment consumers, gas only, 1s. 6·2d. per therm; 4s. 2·96 per 1000 c.ft. Prepayment consumers with hire-purchase fittings, 1s. 6·2d. per therm; 4s. 2·96d. per 1000 c.ft. Ordinary consumers, 1s. 6·2d. per therm; 4s. 2·96d. per 1000 c.ft. Cooker consumers (conditional), 1s. 3d. per therm; 3s. 6d. per 1000 c.ft. Gas fire consumers (conditional), 1s. per therm; 2s. 9·6d. per 1000 c.ft. Engine consumers (conditional), 9d. per therm; 2s. 1·2d. per 1000 c.ft.

The notice explains that the slot meters are set to cover the cost of gas, meter rent, and fittings on hire. Regarding the above prices by volume, it will be noted that 2·8 therms equal 1000 c.ft.

TRADE NOTES.

British Gas Purifying Materials.

The British Gas Purifying Materials Company, Ltd., whose head office is at No. 99, London Road, Leicester, and late of No. 13, Arcadian Gardens, Wood Green, N., have reopened a London office at No. 34/35, Norfolk Street, Strand, W.C. 2, which will be under the management of Mr. H. R. Hill, whose family have been closely connected with the gas industry since its inception.

Labour-Saving Machinery.

A reference book of information relating to the design and application of conveying, elevating, screening, and transmission machinery has been published by the Hebburn Conveyor Company, Ltd., of Wakefield. The guiding idea of this new publication has been to present illustrations and information of differing and typical installations, to assist probable clients in the selection of machinery.

CONTRACTS OPEN.

Resetting Retort Bed.

Tenders are invited by the Haworth Urban District Council for the resetting of retorts. [See advert. on p. 74.]

Exhausting Plant.

The Edinburgh Corporation are prepared to receive tenders for the supply and erection, at the Granton Gas-Works, of a steam-driven four-blade exhausting plant. [See advert. on p. 74.]

Colonial Gas Association Capital Issue.—The issue of preference shares in the Colonial Gas Association, Ltd., the abridged prospectus of which was advertised in the "Journal" for March 18, has been largely over-subscribed. Letters of partial allotment are being sent out this week.

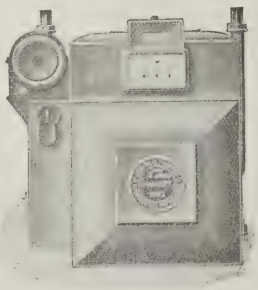
Barnard Castle Gas Company.—The question of undertaking the supply of electricity to the town is under the consideration of the Company. At the annual meeting on March 26 the report of the Directors showed that the sale of gas had increased during the year by nearly a million c.ft. The gross profit was £1210, while the net balance on profit and loss account was £676, which was available for dividend. An interim dividend was paid for the first half of the year, and it was decided to pay a like figure for the second half—4 p.ct. on the original consolidated stock, and £2 17s. on new ordinary stock, free of income-tax, absorbing £260 and leaving £416 to carry forward. The Directors reported that they had taken expert advice on the question of the electricity undertaking. The capital cost was estimated at £14,685, and the estimated revenue for the second year was £3460, leaving an estimated margin for profit of £990. The Directors thought, however, that there would be difficulty at the present time in raising the required capital. It was decided to ascertain by a canvass of the town the number of likely electricity customers.

THE

OLD VICTORY,

AND THE

NEW—



BOTH SUPREME!

SAWER & PURVES,

MILES PLATTING, MANCHESTER.

RADFORD ROAD, NOTTINGHAM.

45-47 WESTMINSTER BRIDGE RD., LONDON, S.E.1.

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

The same general idle conditions continue in the market, and prospects are in no way improved. Some days seem less depressing than others, when a few inquiries from abroad are circulating, but the end of them is generally "gone to Germany." Home demand is not improving, and stocks everywhere on the Continent are large. Consumers continue to buy only for their immediate requirements, and in very few cases can collieries see more than a short distance ahead.

A feature has been a further weakening of Northumberland screened steams, which now range between 16s. 9d. and 17s. 6d. according to quality. Durham coals have not changed appreciably in value, though the demand remains as poor as ever. Wear Special gas makes quote 20s. 6d., but they can probably be had at considerably less than this for prompt definite business. Best qualities (Holmside, Boldon class) are nominally 20s., but obtainable, at any rate in the case of some of them, down to 19s. Other qualities are still 17s. to 17s. 6d. Best unscreened bunkers are about 18s. 3d., and coking unscreened still in poor demand at 17s. 3d. to 17s. 6d.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

The increasing seriousness of the position as the volume of demand contracts and the ratio of overhead charges grows, deepens the anxiety which is felt in every branch of the trade. It is stated that 90 p.ct. of the gas undertakings are in arrear of their contracts. Stocks are so heavy that it is not easy to see how the leeway is to be made up. There is speculation as to what effect this will have upon new contracts when the time comes for negotiation. The market for both household and industrial fuel has become extremely sluggish. Stocks in intermediate hands suffice to satisfy a considerable part of the current demand. The position at the collieries can be inferred from the promptitude with which orders are dispatched. Depreciation of values is accentuated in all descriptions of coal save the best household grades. Two or three weeks are still required for delivery of the latter. The consumption of works fuel tends to decline. In the Staffordshire iron trade, a large amount of plant is idle, and works that are not stopped are running in many cases intermittently.

The stagnation in the pig iron trade reacts on the coke market. Prices are precarious, and the view of ironmasters is that trade recovery is only possible with cheaper fuel. How this is to be reconciled with the present cost of coal-getting, and the unsatisfactory yield of residuals, is the problem to be solved.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

There is no material alteration in the situation of the coal trade in Yorkshire and Lancashire. Gas coal is moving slowly, with indications of decreased prices for renewals of contracts.

House coal continues steady, with prompt supplies available at the majority of the producing points.

Although a better tone prevails among certain of the industrial coal consuming centres, there is no apparent increase of business, notwithstanding that low prices are being quoted for prompt deliveries of the lower-grade fuels. What difference the irregular working of collieries in the near future will make is problematical; but the outlook suggests that some kinds of slack may become scarcer.

The slump in export still continues, with no prospects of improvement, and prices for all qualities are in consequence exceptionally low.

Humber bunker and export prices (f.o.b. usual shipping ports) at the week-end were: South Yorkshire: Hards, Association, 19s. 6d.; screened gas coals, 19s. 6d. to 20s. 6d.; washed trebles, 20s. 6d. to 21s.; washed doubles, 17s. 6d. to 18s.; washed singles, 17s. 3d. to 17s. 9d.; washed smalls, 13s. to 13s. 6d.; unwashed doubles, 15s. 9d. to 16s. 3d.; rough slack, 11s. to 11s. 6d.; smithy peas, 20s. 6d. to 22s.; West Yorkshire Hartleys, 17s. to 19s.; screened gas coal, 19s. to 20s; washed trebles, 18s. 6d. to 19s.; washed doubles, 16s. to 16s. 6d.; washed singles, 16s.; washed smalls, 13s.; unwashed doubles, 13s. 6d. to 14s. 6d.; rough slack, 11s. to 11s. 6d.; coking smalls, 10s. 6d. to 11s. Derbyshire and Nottinghamshire: Top hards, 19s. 3d. to 20s.; washed trebles, 18s.; washed doubles, 18s.; washed singles, 17s. 6d.; washed smalls, 12s. 6d. to 13s.; unwashed doubles, 15s. to 16s.; rough slack, 10s. 6d. to 11s. 6d. Yorkshire, Derby, and Notts: Screened steam coal, 16s. 6d. to 18s.; gas coke, 21s. to 23s.; furnace coke, 17s. 6d. to 18s. 6d.

Queenstown Gas Company.—Presiding at the annual meeting of this Company, Mr. John Roonon (Chairman) pointed out that the bank overdraft had been increased, owing chiefly to a debenture of £600 having been redeemed during the year, and, for the rest, to recent changes in the gas industry—the introduction of cookers and heaters, and the fitting-up of appliances at the Company's expense, which naturally led to more capital being required. To meet this demand they had to borrow, as the troubled conditions that had prevailed in Ireland were not, of course, favourable to raising capital otherwise. When conditions were more settled they would, he hoped, be able to raise capital for further development. He conveyed to Mr. W. E. Young (Resident Manager) and the staff the thanks of the Directors for their loyalty and support. The report was adopted and the statutory dividend declared. At an extraordinary meeting, held subsequently, the Directors were authorized to borrow, if they thought fit, to the extent of the Company's unexercised powers.

STOCK MARKET REPORT.

The announcement of the new Government Conversion Loan was the event of the past week. The terms of the issue, which is for £30,000,000 3½ p.ct. stock with a minimum price of 76¾, were almost identical, after allowing for the periods of the first interest, with those of the last issue. Fears of dearer money are still prevalent in the City, and the uncertainty continues to dominate the stock and share markets.

The 5 p.ct. War Loan remains the cheapest stock in the gilt-edged section, and taking the four months' accrued interest into account can be purchased at below par. Foreign bonds were neglected. Home Rails improved slightly, though the business done was insignificant.

The Industrial Market generally was also depressed. Courtaulds fell away by about 2s. 6d., due possibly to "bear sales." The Dunlop report made a good impression, notwithstanding the fact that there is again no dividend. There has been a good deal of criticism of the Harland and Wolff report, and subscribers to the issue last year of preference shares, which have dropped from £1 to 14s., have good reason to ask for more information with regard to the Company's working.

In the Gas Market the depression still continues. It will be seen from the Table that the Brentford stock dropped a further 2 points to 103-108, which, when one considers that on the news of the amalgamation with the Gas Light Company becoming known transactions took place at 118, is significant, notwithstanding that the Bill has passed the third reading in the Commons. The variation in the quotation of the Gas Light ordinary (now 88½-90½) and the Commercial 4 p.ct. (91-94) is surprising, in view of the fact that at the present prices of gas, 8·6d. and 9·4d. per therm respectively, the authorized dividends for the current half-year are the same—viz., £5 6s. 8d. p.ct. per annum. An important change is the fall of 4 points in the South Suburban ordinary to 100-105. There will shortly be an inquiry into this Company's standard price. The announcement of the Tottenham Company's revised standard is doubtless the cause of the 2¼ points fall in the "B" stock; the "A" stock so far has not been affected.

The following transactions were recorded during the week:

On Monday, Bristol 5 p.ct. maximum 93⅞, Commercial 4 p.ct. 91½, 3½ p.ct. 91½, 3 p.ct. debenture 58, Gas Light and Coke 89⅝, 90⅛, 90⅜, 3½ p.ct. maximum 63½, 4 p.ct. preference 79, 3 p.ct. debenture 60½, Imperial Continental 178⅛, 180, Primitiva 7s. 9d., 8s. 1⅜d., 8s. 3d., 4 p.ct. 1st debentures 79⅝, 80, South African 7⅛, South Metropolitan 95½, 96¼, 96½, 3 p.ct. debenture 61⅛, Swansea 7 p.ct. preference 102⅜, Tottenham "B" 101, Wandsworth "B" 114. Supplementary prices, Ascot new 6 p.ct. preference 101⅛, 10⅛, Kingston-upon-Thames 105½, 105⅛, Wandsworth 3½ p.ct. new 97.

On Tuesday, Alliance and Dublin 70⅝, Bristol 5 p.ct. maximum 93, 93⅛, Continental Union 7 p.ct. preference 89, European 6¾, Gas Light and Coke 89½, 89⅝, 89⅞, 90, 4 p.ct. preference 79⅜, Hastings and St. Leonards 5 p.ct. 94¼, 94⅜, Hornsey 137⅞, 138, Imperial Continental 181, Primitiva 7s. 9⅝d., 8s. 1⅜d., 4 p.ct. 1st debentures 79⅞, 80, South Metropolitan 95¼, 95⅜, 95⅝, 95⅞, 96, Tottenham "B" 100. Supplementary prices, Bath 5 p.ct. debenture 97½, Southend-on-Sea 5 p.ct. new "B" 88½, 89.

On Wednesday, Alliance and Dublin 4 p.ct. debenture 67½, Bombay 5 1/16, Brentford "A" 105, European 6¼, 6⅝, 6 11/16, 6¾, 6 13/16, Gas Light and Coke 89, 89⅜, 4 p.ct. preference 79¼, 3 p.ct. debenture 61, Hastings and St. Leonards 5 p.ct. 94⅜ *ex* div., Montevideo 64½, 65, Primitiva 8s. 3d., 4 p.ct. (River Plate) debenture 65½, 66¼, Sheffield "B" 102⅜ *ex* div., South Metropolitan 95, 3 p.ct. debenture 60⅜, South Suburban 104.

On Thursday, Commercial 4 p.ct. 91, Continental Union 37, 37⅛, European 6⅝, 7, 7 1/16, Gas Light and Coke 89, 89⅛, 89⅜, 89⅝, 89¾, 3½ p.ct. maximum 63¼, 63½, 4 p.ct. preference 78½, 80, Imperial Continental 180, Liverpool 7 p.ct. preference 103½ *ex* div., Montevideo 64⅜, 65, Primitiva 8s. 3d., 8s. 4½d., 4 p.ct. 1st debentures 79⅜, 80, San Paulo 6 p.ct. preference 7⅜, 7 13/16, *ex* div., South Metropolitan 94, 94⅜, 95, 95½. Supplementary prices, Gas Light and Coke 10 p.ct. bonds 198.

On Friday, Bombay 5½, Cape Town 7¼, 4½ p.ct. preference 6¼, 4⅜ p.ct. cons. 1st mt. debenture 73, European 7⅛, Gas Light and Coke 88⅜, 89½, Imperial Continental 182, Primitiva 8s. 1⅜d., 8s. 9d., South Metropolitan 94⅜, 94⅝, South Suburban 5 p.ct. 100, Southampton 84, 84½, Tottenham "A" 119, "B" 100, Wandsworth (Wimbledon) 111, 112. Supplementary prices, Cheltenham 5 p.ct. max. 78½.

Money was scarce in Lombard Street last week, and a small amount had to be borrowed from the Bank of England at 5½ p.ct. The Treasury Bill rate rose again; the average rate at which bills were issued being £5 7s. 1·59d. p.ct.

The fall in the dollar-sterling exchange on Friday to 4.77 1/16 was reported to be due to false reports having reached New York that Great Britain had decided to postpone the restoration of the gold standard. The rate subsequently recovered to 4.77⅛, but fell again to the former figure on Saturday. French francs eased to 90.45, and Belgian francs to 93.15, but Italian lire were firm at 116.87½.

Both Silver and Gold cheapened on the week at 31⅛d. and 86s. 5d. per oz. respectively.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on March 5. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3¼ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Mar. 27.	Rise + or Fall − on Week.	Transaction Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 5	5	5	Aldershot 5 p.c. max. C. .	78–81	..	..
295,492	,,	,,	4	4	Do. 4 p.c. Pref. . .	71–76	..	..
1,351,868	,,	Sept. 25	6	6½	Alliance & Dublin Ord. .	65–70	..	70 5/16
374,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb. . .	61–66	..	67¼
300,000	5	Oct. 23	8	8	Bombay, Ltd.	5–5⅛	..	5 1/16–5⅛
100,000	10	Mar. 5	8½	8½	Bournemouth 5 p.c. . .	12–13	..	..
425,050	10	,,	7	7	Do. B 7 p.c.. .	12½–12¾	..	..
150,000	10	,,	6	6	Do. Pref. 6 p.c..	10¾–11¼	..	..
50,000	Stk.	Jan. 8	3	3	Do. 3 p.c. Deb..	56–59	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb..	76–79	..	..
902,045	,,	Mar. 5	6 3/10	6 3/10	Brentford A Com. . . .	103–108	−2	105
900,800	,,	,,	6¾	6¾	Do. B New . . .	103–107	−2	..
76,000	,,	,,	5	5	Do. 5 p.c. Pref. . .	95–98	..	..
306,690	,,	Dec. 18	4	4	Do. 4 p.c. Deb. . .	76–81	..	..
181,337	,,	,,	6	6	Do. 6 p.c. Rich. Red. Deb.	100–105	..	..
214,740	,,	Mar. 5	11¼	12¾	Brighton & Hove Orig. .	165–170	..	..
244,200	,,	,,	8¾	9¼	Do. A Ord. . . .	122–125	..	..
1,287,500	,,	Feb. 19	5	5	Bristol 5 p.c. max. . . .	96¼–97¼*d*	..	93–93⅜
855,000	,,	Mar. 19	8	7	British Ord.	112–115*	..	..
100,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref. . .	123–128	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. .	72–77	..	..
100,000	10	Dec. 18	8	6	Cape Town, Ltd. . . .	7–8	..	7¼
100,000	10	Nov. 6	4½	4½	Do. 4½ p.c. Pref.. .	6–7	..	6½
150,000	Stk.	Dec. 18	4½	4½	Do. 4½ p.c. Deb.. .	71–76	..	73
626,860	,,	Feb. 19	6	6	Cardiff Con. Ord. . . .	101–104	..	..
237,860	,,	Jan. 8	7¼	7¼	Do. 7¼ p.c. Red. Deb. .	104–107	..	..
157,150	,,	Feb. 19	5	6¼	Chester 5 p.c. Ord. . . .	89¼–94½*b*	..	..
1,513,280	,,	Mar. 5	6	5/14/8	Commercial 4 p.c. Cap. .	91–94	..	91–91⅞
560,000	,,	,,	5	5⅜	Do. 3½ p.c. Cap. .	91–94	..	91⅞
475,000	,,	Dec. 18	3	3	Do. 3 p.c. Deb. .	57–60	..	58
800,000	,,	14 Jan. 15	—	—	Continental Union, Ltd. .	37–42	..	37–37⅛
200,000	,,	Dec. 18	7	7	European, Ltd.	5–8	..	6¾–7⅛
16,460,070	Stk	Feb. 19	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	88½–90½	−1	88⅜–90⅜
2,600,000	,,	,,	3⅜	3⅜	Do. 3½ p.c. max. .	62–65	..	63⅛–63⅜
4,062,235	,,	,,	4	4	Do. 4 p.c. Con. Pref.	78–80	−1	78⅛–80
4,761,930	,,	Dec. 18	3	3	Do. 3 p.c. Con. Deb.	59–62	..	60⅛–61
130,000	,,	—	10	10	Do. 10 p.c. Bonds . .	..	..	198
48,000	,,	—	7¼	7¼	Do. 7¾ p.c. Red Deb.	..	..	..
82,500	,,	Mar. 19	6½	6½	Hastings & St. L. 5 p.c. Conv.	92–97*	..	94¼–94⅜
258,740	,,	,,	5⅛	5⅛	Do. 3½ p.c. Conv.	73–78*	..	..
70,000	10	Sept. 25	10	10	Hongkong & China, Ltd. .	16–17	..	..
86,600	Stk.	Mar. 5	10	10	Hornsey 7 p.c.	138–143	..	137½–138
1,976,000	,,	Nov. 20	30	10	Imperial Continental Cap. .	178–183	+3	178½–182
263,950	,,	Feb. 5	3½	3½	Do. 3½ p.c. Red. Deb.	71–74	..	..
235,242	,,	Mar. 19	6½	6½	Lea Bridge 5 p.c. Ord.. .	96–101*	..	..
2,127,340	,,	Feb. 19	5½	5½	Liverpool 5 p.c. Ord. . .	87½–88½*b*	..	..
600,000	,,	Mar. 19	7	7	Do. 7 p.c. Red. Pref.	104–103*	−½	103⅛
166,736	,,	Feb. 19	9	8	Maidstone 5 p.c. Cap. . .	123–132	..	..
63,480	,,	Dec. 18	3	3	Do. 3 p.c. Deb.. .	54–59	..	..
75,000	5	Dec. 4	7	5	Malta & Mediterranean . .	4–4½	..	..
541,920	Stk.	Nov. 20	4	4	Montevideo, Ltd.	62–67	..	64½–65
2,061,315	,,	Mar. 5	5	5	Newcastle & Gateshead Con.	81–82*d*	−½	..
300,929	,,	,,	4	4	Do. 4 p.c. Pref..	72½–73½*d*	..	..
529,705	,,	Dec. 18	3½	3½	Do. 3½ p.c. Deb.	66–69	..	..
15,000	10	Mar. 5	11	12	North Middlesex 10 p.c. .	15⅛–16½	..	..
75,940	10	,,	7 7/10	8⅜	Do. 7 p.c. .	11–11½	..	..
300,000	Stk.	Dec. 4	7	9	Oriental, Ltd.	102–107	..	..
188,120	,,	Jan. 8	7¼	7¼	Plym'th & Ston'house 5 p.c.	109–114	..	..
60,000	50	Mar. 5	13	14	Portsea Island B . . .	96–99	..	..
100,000	50	,,	12	13	Do. C	93–98	..	..
2,289,909	1	—	—	—	Primitiva Ord.	8/0–9/0	+/3	7/9–8/9
311,100	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb.. .	79–81	..	79½–80
600,000	Stk.	Jan. 22	4	4	Do. 4 p.c. Red. Deb. 1911	65–65	..	..
220,335	,,	Dec. 18	4	4	Do. B. Aires 4 p.c. Red. Db.	65–67	..	..
321,670	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	65–67	..	65½–66¼
150,000	10	Mar. 19	6	6	San Paulo 6 p.c. Pref. . .	7⅛–8*	..	7⅜–7 13/16
125,000	50	Jan. 2	5	5	Do. 5 p.c. Red. Deb.	43–46	..	..
270,000	Stk.	Aug. 28	5/8/4	5⅜	Sheffield A	104–106*x*	..	..
419,968	,,	,,	5/8/4	5⅜	Do. B	104–105*x*	..	102⅜
1,047,000	,,	,,	5/8/4	5⅜	Do. C	104–106*x*	..	..
90,000	10	Oct. 23	8	6	South African	7–9	..	..
5,609,895	Stk.	Feb 19	5	6¼	South Met. Ord..	94–95	−1½	94–96¼
1,895,445	,,	Jan. 8	3	3	Do. 3 p.c. Deb. . .	59–62	..	60¾–61¼
734,000	,,	Mar. 5	6¼	6¼	Do. 6¼ p.c. Red.Deb.	102½–104½	..	..
91,500	,,	Mar. 5	8¾	8¾	South Shields Con. . . .	135–136*d*	..	..
1,187,795	,,	Feb. 19	6¼	6¼	South Suburban Ord. 5 p.c.	100–105	−4	100–104
368,837	,,	Dec. 18	5	5	Do. 5 p.c. Deb.	97–100	..	..
647,740	,,	Nov. 6	5	5	South'mpt'n Ord. 5 p.c. max.	83–86	..	84–84½
121,275	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	72–77	..	..
250,000	,,	Mar. 5	7	7	Swansea 7 p.c. Red. Pref..	101–103	..	102⅜
200,000	,,	Dec. 18	6¼	6¼	Do. 6¼ p.c. Red. Deb..	103–105	..	..
120,000	,,	Feb. 19	8	8	Tottenham District A 5 p.c.	116–119	..	119
882,275	,,	,,	6¼	6¼	Do. B 3½ p.c.	97½–100⅜	−2½	100–101
281,255	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	75–7	..	..
258,251	,,	Mar. 19	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, &	77–79*d*	−2	..
197,294	,,	Feb. 19	6¼	6¼	Wycombe 5 p.c.. . .	100–105	..	..
88,330	,,	,,	5	5	Do. 5 p.c. pref. .	93–98	..	..
91,800	,,	,,	—	6¼	Do. 5 p.c. Maidenh'd	90–95	..	..
30,000	,,	Mar. 5	9¼	9¼	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c. .	135–140	..	..
455,636	,,	,,	7¼	7¼	Do. B 3½ p.c. .	114–119	..	114
392,955	,,	,,	6/9/6	6/9/6	Do. C and New	97–102	..	97
352,000	,,	,,	7⅛	7¼	Wimbledon 5 p.c.t. . .	109–114	..	111–112
98,000	,,	,,	7⅛	7¼	Epsom 5 p.c.t.. . . .	117–122	..	..
88,416	,,	Dec. 18	3	3	5 p.c. Deb.	57–60	..	..

Quotations at:—a_x—Bristol, b_x—Liverpool, c_x—Nottingham, d_x—Newcastle, e_x—Sheffield. * Ex, div.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *March* 30.

There is no alteration to record in pitch in the London market—the position remaining as last reported.

Creosote also is unchanged at from 7⅞d. to 7¼d. per gallon net and naked at works.

Solvent naphtha is in good demand, and supplies are scarce. The price is firm at about 1s. 8d. net per gallon for the 95/160 quality.

Pure benzole and pure toluole are about 1s. 10d. to 1s. 11d. net per gallon.

Tar Products in the Provinces.

March 30.

There is very little fresh to report concerning the markets for tar products.

Although there has been a little inquiry for pitch, there is no alteration in the price.

Creosote remains the same.

Benzole and solvent naphtha are steady.

The average values for gas-works products during last week were: Gas-works coal tar, 29s. 3d. to 34s. 3d. Pitch, East Coast, 40s. to 41s. f.o.b. West Coast—Manchester, 35s. to 36s.; Liverpool, 36s. to 37s.; Clyde, 39s. to 40s.; Benzole, 90 p.c.t., North, 1s. 7¼d. to 1s. 8½d.; crude, 65 p.c.t., at 120° C., 10¼d. to 11¼d., naked at makers' works; 50-90 p.c.t., naked, North, 1s. 2d. to 1s. 3d. Toluole, naked, North, 1s. 7¼d. to 1s. 8½d., nominal. Coal-tar crude naphtha, in bulk, North, 7¼d. to 8d. Solvent naphtha, naked, North, 1s. 5d. to 1s. 6d. Heavy naphtha, North, 1s. 1d. to 1s. 2d. Creosote, in bulk, North, liquid, 6¼d. to 6½d.; salty, 6¼d. to 6½d.; Scotland, 6d. to 6¼d. Heavy oils, in bulk, North, 6½d. to 7d. Carbolic acid, 1s. 6d. to 1s. 7d. prompt. Naphthalene, £12 to £15; salts, £4 to £5, bags included. Anthracene, "A" quality 3d. per minimum 40 p.c.t., purely nominal; "B" unsaleable.

Commercial Gas Company's Increased Price.—The Commercial Gas Company announce an increase in the price of gas from the Lady Day quarter from 8⅛d. per therm to 9⅛d. for quarterly consumers and 10⅛d. to 11⅛d. per therm for automatic meters

Sheffield Gas Company.—The third annual dinner of the Angling Section of the Company's Sports and Social Club was held on Friday, March 20. There were 71 members and friends present; and the Hon. President of the Club, Mr. Ralph Halkett (General Manager and Secretary of the Company), presided.

Gas Meter Manufacturers and Inspectors at Manchester.—On Wednesday, March 25, the Executive Committee of the Statutory Gas Meter Inspectors' Association of Great Britain met at the Gas Meter Testing Station, Manchester, under the presidency of Mr. G. Hume (London). Assembling in the same rooms on Thursday, the inspectors were joined by Mr. H. N. Barrow (Chairman) and most of his colleagues on the City Justices Gas Meter Testing Committee. The party were entertained at luncheon in the Town Hall, at the invitation of the Lord Mayor (Alderman F. J. West), who presided. He said that they had every reason to be proud of the Manchester Testing Station. Sir Henry Cowan moved a vote of thanks to the Lord Mayor. Mr. Braddock and Mr. Templer Depree were present at the luncheon.

Sheffield Illumination Society.—At a meeting of the Society held on March 26, Mr. Ralph Halkett, the General Manager and Secretary of the Sheffield Gas Company, gave a lecture entitled "Gas Topics," treating the subject in a general and popular way.

Lewes Gas Company.—Gratifying progress was reported at the half-yearly meeting of the Company, at which Mr. E. Monk (Chairman) presided. He said that the revenue account showed a profit of £2181 for the half-year. After providing for income-tax, interest on mortgages, &c., the balance of net revenue was £2597. The Directors recommended the payment of dividends for the half-year at the rate of 5 p.c.t. on the original stock, and 3½ p.c.t. on the additional stock. Mr. Monk drew attention to the increase in the sales of gas.

Exmouth Gas Company.—The annual meeting of the Company was held on March 26—Rev. C. R. Carr presiding. A dividend of 7 p.c.t. (less tax) for the past year was recommended on the consolidated ordinary shares. The sales for the year showed an increase of 30,756 therms over the year 1923; this being equal to 6·6 p.c.t. In order to meet the increasing demands for gas, the installation of additional plant at the works, and the extension and enlargement of the district mains were under consideration. The Chairman, in moving the adoption of the report, congratulated the Company on another successful year's trading.

Dartmouth Gas, Coke, and Coal Company, Ltd.—Proposing the adoption of the annual report at the general meeting of the shareholders of the Company, Mr. Harold Adams said the working profit for the year was £2268. The receipts from the sales of gas, coke, and sulphate of ammonia had been maintained, and in each case slightly increased revenue was shown, but there was a reduction of £80 from the revenue for tar. There had been a steadily increasing demand for gas. The distribution of the full dividend of 5 p.c.t. on the second preference shares and 10 p.c.t. on the ordinary shares was recommended; and it was proposed to carry the sum of £500 to the general reserve fund account, and £500 to the reserve fund account for repairs, maintenance, and renewals of plant and works. A reduction of 4d. per 1000 c.ft. would be made from April 1. In order to encourage the permanent employees to provide for their old age, the Directors inaugurated a contributory pension scheme last December.

At a recent meeting of the Whitwell Parish Council, it was decided to ask the local Gas Company for a reduction in the price of gas, which is now 5s. 6d. per 1000 c.ft.

At a whist tournament and dance given at Devonport in connection with the Plymouth Corporation Gas-Works Sports Club the prizes were given by the Chairman (Mr. J. C. Tozer) and Vice-Chairman of the Gas Committee, and the staff of the Gas Department.

The Leeds Corporation Gas Committee recently considered whether or not the price of gas should be increased in view of the past year's working having shown a deficit of £28,000. It was decided that such a course would be inexpedient. The present price is 3s. 9d. per 1000 c.ft.

At a recent meeting of the Morecambe Gas Committee, the Town Clerk reported that the Ministry of Health had sanctioned the following loans: Extension of mains, £3690; carburetted water gas plant £2660; washer, £2572; land, £1285; building for carburetted water gas plant, £1000; and meter, £340.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

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Orders to Alter or Stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Monday.

UNDISPLAYED ADVERTISEMENTS; Situations Wanted, Six Lines and under (about 36 words), 3s.; each additional Line, 6d. Situations Vacant, Apparatus Wanted and for Sale, Contracts, Public Notices, &c., 9d. per Line—minimum, 4s. 6d.

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EDITORIAL NOTES.

The Legislature and Gas-Electricity Supplies.

THE report of the proceedings on the Horley Gas (Electricity Supply) Bill before the Earl of Clarendon's Committee, is completed in this issue. These proceedings have more importance than merely the local aspect. They have definitely raised in Parliament the improved modern conditions of gas undertakings for economically providing an electricity supply for areas in which there is at present no such service; and, furthermore, they have brought to the knowledge of the Legislature the actual experiences of gas companies who are giving a supply of electricity, and which prove the mythical or groundless nature of the professed notion of opponents that the two services under one administration would not answer. The predictions have not materialized, as is evidenced by what Mr. A. E. Broadberry told their Lordships as to what has happened in the Wood Green area of the Tottenham District Light, Heat, and Power Company, and by Mr. H. J. Randall, regarding the developments of the Yorktown and Blackwater Gas and Electricity Company. The actual accomplishments of administration and management of the dual systems should alone be sufficient to convince Parliament that the absurd contention of electrical opponents, that a community would not be served well electrically by a gas company, has no foundation in fact. Moreover, we submit that in this connection the real question to be considered by Parliament is as to whether competition in these small districts is, from the public point of view, preferable to the economies which it is palpably obvious can be realized by an established and well-organized gas concern. Testimony in this Horley case proves that these economies can be, in the aggregate, of a substantial order; and, therefore, in the interests of a community, it is unquestionably better to permit of the development of the economies than to set up a competition which, to be profitable on both sides, must mean a loss to the communities, having regard to the limited trading potentiality in areas of small population. In such circumstances, every case requires to be considered on its merits. It is no use pointing to the fuel economies of distant large super-stations when it is learned that the transmission costs may represent some 50 to 60 p.ct. of the total cost of delivering electrical energy to the consumers in these small residential areas. A notable feature of this Horley case is that a number of expert witnesses, gas and electrical—whose positions alone warrant the genuineness of their views on the subject, and whose reputations would be in jeopardy were those views not capable of materialization—testified to many economies which must result from the combination of the two services; and we have searched the opposing evidence to find any real destructive criticism, but have failed. Not only was there the evidence in favour by Mr. Broadberry and Mr. Randall, but there was that by Mr. G. M. Gill and Mr. A. Hugh Seabrook; the last-mentioned an electrical engineer who for several years has been making a thorough study of the capabilities of gas undertakings for incorporating in their systems the supply of electricity in areas at present denied the service.

If we combine the points as to economies from the evidence of the four witnesses named, they may be taken generally to be: The existing site of a gas undertaking can be utilized for the generating station, together with railway sidings and other plant for handling material. One administration and management, and the same staff (probably slightly enlarged) can be utilized. The office accommodation and clerical staff can be employed to greater efficiency. Compared with separate undertakings, there would be a saving in rates and taxes; and in respect of work on the district, the same transport facilities would be available, and arrangements could be made so that any work required by both distribution systems could, when breaking-up streets, be carried out simultaneously. Another advantage would be in connection with the raising of capital—particularly by gas companies working under the sliding-scale. In such cases, capital would be obtained at a lower price than in the case of a new company, which had to make its way, and whose future capital-raising power would be detrimentally affected in the event of the concern not proving remunerative to the original investors. What the position of the consumers would be in such circumstances can be well imagined. In these several ways, there must be greater efficiency and economy than could be realized by two comparatively small undertakings run independently. The principal argument for super-power stations is that concentration promotes economy in respect of fuel costs; this quite apart from transmission cost considerations. We submit that, if economy can be realized by the concentration of generation, then it follows that enlarging the scope of a gas undertaking to electricity supply, thus concentrating the work in one establishment, must raise the capacity of that concern for producing greater economy.

In this case, however, we are carried further than these economies which have been put forward from time to time in connection with schemes of combined gas and electricity supplies. In technical circles, the question of the utilization of fuel in the best possible manner, in order to realize in the national interests a greater industrial efficiency and therefore economy, has been discussed for some time. In this particular instance, we have the matter in one form brought before Parliament from the point of view of the gas industry. It is true, and gas engineers do not deny it, that until quite recent times there was a considerable quantity of heat waste from gas-works processes, which there had been no serious attempt to utilize profitably. But modern practice has altered this, by using waste-heat boilers for raising steam; and in this direction, no doubt, there will be considerable developments. It is a contribution to the conservation of fuel; and now the question arises as to the application of waste heat in the case of medium and small-sized undertakings to electricity generation. At the present time, the gas industry is suffering from a slump in connection with its secondary products—coke and coke breeze among them. The problem of disposal is comparatively one of more serious moment to the smaller undertakings than to the larger ones, in view of the fact that the latter have, though producing proportionately more coke, greater opportunities for sale owing to industrial demand. In the smaller concerns, therefore, it would be a fortunate circumstance to be in a position to utilize the poorer part of the home-produced solid fuel, for which there is little local demand, for steam raising for ordinary gas-works purposes, and to put the waste heat from the gas-manufacturing processes to use for the generation of electricity. The opponents appear to be

somewhat dubious as to what can be done in this direction. Actual experience is much better than postulation and doubt, and the experience now of the use of waste-heat boilers on gas-works is of a sufficient order to act as a guide to what can actually be done. There was some attempt on the part of the opponents to belittle this aspect of the case of the Horley Company. In present circumstances, Mr. Gill computes that in the winter months, when electricity would be most required for lighting purposes, the Horley gas undertaking could generate something like 900 lbs. of steam per hour from waste heat; and by Mr. Seabrook it was calculated that in the first year the undertaking could produce from its own surplus heat something like 75 p.ct. of the electrical units which would be required, while the remainder could be met by an internal combustion engine running on gas or oil as preferred. Of course, in the event of the gas sales increasing, the available surplus heat would be augmented. Mr. Seabrook also alluded to those engineers who scoff at the suggestion that gas-works produce sufficient surplus heat to be of any use for the production of electrical energy—in fact, he hinted that some well-known men had described it as a "stunt." The "stunt" is a very substantial and paying practice in gas-works to-day; and in confirmation of this, Mr. Seabrook told of one gas company who are at their largest works putting down a 2000-kw. plant; the whole of the steam used being produced by surplus-heat boilers. The same company are also considering the cost of converting the surplus heat to electricity, and disposing of it to outside users. One or two other large undertakings have experimented, and are prepared to spend a considerable capital sum in proving the idea.

Now that the utilization of waste heat and other fuel supplies in gas-works has been raised to the Parliamentary platform, it must be kept there, and insistence be made as to its recognition as a contribution from the gas industry to the pressing problem of the conservation of our national fuel resources by the co-ordination of the use of fuel, whatever its nature, in public and industrial service. In the controversy that is sure to arise, we would ask the opponents of the gas industry not to do as was done in this Horley case—compare the results of the working of electricity undertakings of large magnitude with the small plants run by gas undertakings in formerly electrically neglected areas. There must be comparison of like with like.

One other point. The Horley Gas Company in this matter of applying for electricity powers have been placed at a distinct disadvantage by the political disturbances of recent years. It was as far back as November, 1923, that public announcement was made, at a meeting of the Gas Companies' Protection Association, of the proposed introduction of a Bill to empower gas undertakings to apply to the Electricity Commissioners for Supply Orders; and the Bill had been under consideration some time prior to that. The Bill is the one which was introduced by Mr. Reginald Clarry; but through the political upheavals of recent times, it has not been able to reach the Statute Book, though there is good chance of its doing so now. The Horley Gas Company delayed their application for supply powers in the hope of realizing them (by the authorization to be conferred by the General Bill) through the Electricity Commissioners. A local Electricity Company were thus able to forestall them. Hence the Bill. But expedition is on the side of an Order; and the Electricity Commissioners succeeded in dealing with the Electricity Company's application, despite the objections raised by the Gas Company, before the latter could get their Bill under way in Parliament. Fortunately, however, the Order has not yet been confirmed. The defence of the Electricity Commissioners for their action is that they had only the one scheme before them, and not the one that was before Parliament. This shows the urgent necessity there is for the Bill introduced by Mr. Clarry (which will co-ordinate procedure in such a case as this) being passed promptly, if gas undertakings are further to assist in serving the community by bringing to bear upon the supply of electricity in suitable areas the facilities and economic advantages they can offer. It is opposed to the public interest (where electricity is required) not to have the supply that can be made available in the most economic manner. The Lords Committee were manifestly of this opinion, inasmuch as they passed the Gas Company's Bill, on the condition that the works were completed to afford a supply in the compulsory area within twelve months from the date of Royal Assent. If the Bill succeeds throughout the rest of its Parliamentary journey, the Horley Gas Company will fulfil without question the obligation imposed upon them.

Gas Fires and Carbon Monoxide.

The attack from Salford on gas-fires owing to supposed carbon monoxide emanations from them into the air of rooms, and thence into the systems of the occupants, has had no effect upon the rate of the growth of popularity of this means of heating. "The proof of the pudding is in the eating;" and new connections prove a wholesome appreciation of the virtues of gas-fires on the part of the public through experience of them. The traducing of those virtues, however, demanded an authoritative research into the matter to confirm or refute the allegations; and this we find has been made by Dr. Leonard Hill, F.R.S., and Mr. T. C. Angus, D.F.C., of the Department of Applied Physiology, National Institute for Medical Research. The results were communicated to the "British Medical Journal;" and, by the courtesy of Dr. Leonard Hill in complying with a request we made to him for permission to reproduce the communication, we are able to give it in later columns. The authority of the experimenters and the results of the severe research will completely set at rest any alarm which may have been occasioned by statements, unsupported by acceptable evidence, as to the probability of chronic poisoning from the inhalation of carbon monoxide escaping from gas-fires, and will thus assist in the work that is being done to clarify the air, and to give an adequate supply of health-yielding ultra-violet rays. It will be noticed that these authorities assert that "carbon monoxide has no poisonous effect other than that of combining with hæmoglobin, and depriving the tissues of oxygen."

In the experiments a standard solution of hæmoglobin was used in a test tube; and the tests were so arranged that air was drawn from the neighbourhood of a gas-fire—a 12-in. one of modern type, used at full capacity. The results of the crucial investigation leave no room for doubt as to the positive immunity of users of gas-fires with flues from risk of carbon monoxide. The experimenters did not rely on a single test or a number under the same conditions, but carried out several in different circumstances. In the first one, air was drawn from the neighbourhood of the gas-fire, and during an hour 760 litres of air travelled over the standard hæmoglobin solution. No perceptible alteration resulted in it. A fresh introduction of the solution was made; and the experiments were continued for another eighty minutes. No change occurred after 1304 litres of air had been drawn over the solution. Thus, in two hours and twenty minutes, more air from the neighbourhood of the gas-fire was passed over the solution than a man would breathe. Air was also bubbled through the solution, with the same results. Further, air was drawn from the proximity of a gas-fire in another room; and there was no indication of carbon monoxide. No evidence of its presence was secured on a windy day. A further experiment was with a gas-fire arranged in the grate of an ordinary open fireplace. Again no evidence of carbon monoxide was found. Other still more severe tests gave negative results. Four flueless stoves placed in a small room with doors and windows closed revealed how little is the amount of carbon monoxide from bunsen flames burning in modern gas-fires.

The tests completely confirm that from modern gas-fires with flues there is no escape of carbon monoxide into the room; but the experimenters held, and there will be general concurrence, that no flueless gas heating stoves should be used in "sealed-up places" where natural ventilation is almost *nil*. In such cases gas-fires with flues should be employed. The tests being of such a severe and delicate character are highly valuable. The full details will be found in the article in later columns.

Powers under the Public Utility Companies (Capital Issues) Act, 1920.

The Public Utility Companies (Capital Issues) Act of 1920 expires on May 20; and the question of the position of companies who have unexercised powers under it has been raised. There has been a division of opinion as to whether those powers may be exercised after May 20. Some have thought they may; others have been of the contrary opinion. The weight of argument is distinctly on the side of the latter. The National Gas Council have to be thanked for placing a case before Counsel and obtaining an opinion against which, it seems to us, it is impossible to advance any argument which would have any validity. The Act had a duration of five years from its Royal Assent; and therefore it may be considered that the Legislature regarded this as the period of stringency, and that the powers they specially conferred should be consummated within that period to be effective. It is obvious that, if the obtaining of the consent of the Board of Trade to the issue of capital under the Act permitted the power to be exercised for an indefinite period, some gas company administrations might deliberately have secured consent for the purpose of over-riding the Special Acts of their undertakings for a longer period than the prescribed quinquennium. Whatever has been completed within the period of five years from the passing of the Act cannot possibly be affected; but whatever has been left undone cannot, in Counsel's opinion, be completed—there must be reversion to the powers under the Company's Special Acts or Orders. In other words, though the consent of the Board of Trade has been obtained, after May 20 the power to do the things to which the Board have consented will have gone. The consent is not the authority for carrying out any of the operations. The Act is the authority; and the Act will on May 20 have run its course. Even though there has been a passing of a resolution by the proprietors to issue capital in accordance with the consent of the Board of Trade, if the capital has not actually been issued at the time the Act expires, all further procedure is arrested by that fact. Counsel is of opinion that the Legislature did not intend to enable companies by these simple expedients to free themselves from the conditions of their Special Acts for an indefinite period. But all that has been done and completed within the terms of the Act during its effective life will continue to be valid. In the case submitted to Counsel, the important question was asked: "Whether, for the purpose of redemption of stock "actually issued as redeemable stock, the company is at "liberty to rely upon the terms of resolution passed "before the date of the Act by which redemption does not "take place until a later period when the Act has ex-"pired?" The reply is: "In my opinion, if the resolu-"tion so provides, the new stock which may be created "and issued to provide money for paying-off the stock "created and issued under the resolution or to provide "substituted stock may be issued as redeemable."

Coal Costs and Output.

The meetings of the Joint Committee of coalowners and miners at which an investigation is being made of the economic conditions of the industry are being held in private; but there is sufficient information published at the close of the conferences to indicate the course of the research. It should become clearer and clearer to the miners' representatives, if it was not sufficiently plain before, that they are responsible to a very large extent for the handicap that has been put upon the British coal industry in comparison with other countries which are growing, or have already grown, into serious competitors of our coal in the markets abroad; and this has a very grave effect upon requirements from British collieries, and therefore upon prices. The very position of the economic conditions of the British coal industry to-day is an invitation to the producers and users of coal in other countries to avoid British coal. Hence the closing-down of the less remunerative pits in this country, and the increasing number of unemployed men, regarding whom there must be a discount from the number when comparison is made with pre-war conditions, seeing that fewer were then employed for a larger output. The last conferences which have been held have been particularly directed to comparisons of costs of production and the outputs per man-shift in this country, on the Continent, and in America, as well as with the similar data for 1914. All through the piece, this country is showing to greater disadvantage in contrast with the statistics from other countries. We have here in the mining industry the shorter working day of seven instead of eight hours, which has had a considerable effect upon the output per man-shift. Furthermore, the wage rate is higher in this country than in others; and, owing to these conditions, the cost of production per ton has about doubled in the years since the commencement of the war. What may seem anomalous is that, in the coal areas where payments to the men are highest, the wage cost per ton is the lowest. This is entirely due to the effect of greater output per man-shift. It is, therefore, perfectly obvious that a vital factor in the cost of production is the man-shift output. The comparisons are proving in every way that British coal is very seriously handicapped in foreign markets through the higher output and the lower cost of production in countries which are in competition with us. Yet singular to state, with these plain facts before them, the miners' representatives decline even to consider the question of increasing the statutory seven-hour day, in order to augment the output per man-shift, and thus do something towards placing the British coal industry in a better position. What they would prefer to achieve is to shorten the hours of work and increase the rates of pay of the miners in Germany, with a view to ruling out the advantageous position occupied by German coal through the larger production at a lower cost per shift. That is an ideal, however, regarding which the German people would have something to say; and they are not likely to agree to their lines of policy in this matter being dictated by the Miners' Federation of Great Britain solely to bring about a competitive equality. Of course, another matter which affects adversely the cost of coal in this country is the increased railway freightage. Figures which have been placed before the Joint Committee show advances ranging from 50 to 88 p.ct. above pre-war rates. The investigations by the Committee are not yet complete; and therefore the Federation have decided to defer a further delegate conference to consider the wage programme and the ending or amending of the existing agreement.

Wembley.

The British Empire Exhibition will be opened on Wednesday, May 6.

"Waste Heat" or "Surplus Heat."

It is contended by Mr. A. Hugh Seabrook that to call heat "waste" which can be put to profitable use is a "terminological inexactitude." What has been known as waste heat on gas-works he contends is heat that has been wasted before it became to be applied to the raising of steam; but as it then comes into account, and increases the thermal efficiency of the gas-works processes, it can no longer be named waste. His view is that "surplus heat" would be a better name for heat which can be usefully applied.

Fixing of Geysers.

The present position regarding the controversy between the National Gas Council and the Metropolitan Water Board as to the fixing of geysers, points to the probability, as no satisfaction can be obtained from the latter, that it will be found desirable to inform the Water Board forthwith that the Council intend advising the Ministry of Health of the Board's refusal, and asking for an inquiry to be held.

Fuel Conservation and Electricity Supply.

The Industrial Group in the House of Commons are considering the question of the proposals for the development of electricity supply in the country; and they have appointed a Committee to go into the matter during the forthcoming parliamentary recess. It is stated that the Ministry of Transport have not yet received the report from the Committee presided

over by Lord Weir; but the problem is one of such complexity and difficulty that the Government do not expect to be able to deal with it this session. The Committee of the Industrial Group ought to have available information as to the power question being a larger one than is covered by electricity supply; that the conservation of coal and the co-ordination of the use of fuel supplies come into its scope; and that the gas industry occupies a place in the matter of power and heat provision, and can and does render important service in this connection and offers opportunities of national advantage, which should not be ignored by any responsible body of legislators.

Which Flicker?

The Paddington Borough Council seriously devoted time last week to a proposal that a Committee should be appointed to consider and report upon the question as to whether it would be a convenience to the public of London if the electric light were made to flicker for an instant at nine p.m. The idea emanated from Sir John Ramsay, who said a time signal of the kind was a feature of life in a town in South Africa where he used to reside. The impossibility of synchronizing a flicker all over London was pointed out. One of the Aldermen wanted to know how the right flicker would be recognized, because the electric lights in his house flickered all night. There was laughter. The idea was rejected.

Low Gas Coke Shipments.

There has been a large decline in the shipments of gas coke. The quantity exported in February was 41,714 tons, which realized £63,807, or an average of £1 10s. 7d. per ton. In February of last year, 105,227 tons were sent abroad; and in the same month of 1923, 106,233 tons. The values were: 1924, £183,323; 1923, £152,927. Taking the two months of the year, the exports amounted to 105,520 tons; the value being £163,685. In the corresponding period of 1924, 249,629 tons were shipped of a value of £432,653. The figures for 1923 were 200,688 tons; and the value £284,164. The metallurgical coke trade has also experienced a marked fall. The exports last month amounted to 102,083 tons, as compared with 156,142 tons in 1924, and 146,662 tons in 1923. In the two months of the year, the shipments of the metallurgical variety were 240,169 tons; 1924, 420,395 tons; 1923, 327,513 tons—the values being respectively £326,111, £844,172, and £529,280.

Exports of Tar Products.

Less benzole continues to leave the country. The quantity exported in February was down to 2252 gallons, as compared with 223,429 gallons in February, 1924. In January and February, 62,480 gallons was the total shipped; and this compares with 239,503 gallons in the corresponding months of last year. Of naphtha 5019 gallons were sent abroad last month, as against 31,628 gallons in February, 1924. In the two months only 7432 gallons were shipped, as contrasted with 45,159 gallons in 1924. Compared with January, February saw a large increase in the shipments of tar, oil, creosote, &c.—the figure being 4,097,259 gallons, compared with 1,640,009 gallons in February, 1924. The total for January and February was 7,765,666 gallons, which is more by 486,216 gallons than in the same two months of 1924.

Sulphate of Ammonia Exports.

In February, 27,975 tons of sulphate of ammonia were sold for overseas use, as compared with 24,648 tons in February, 1924. Taking January and February together, 60,409 tons were exported, as against 60,937 tons in the corresponding period of 1924. In the two months this year, Spain and the Canaries have been the best customers with 21,425 tons, compared with 12,784 tons in 1924. Japan comes next with 12,282 tons, but in the same period of last year that country bought 24,206 tons. The Dutch East Indies was in the two months a buyer to the amount of 10,519 tons, which is nearly 3500 tons better than in the same period of last year. The markets fluctuate, but the total for the two months (as seen above) is only about 500 tons behind 1924, which is a difference that may in a period of two months easily occur in business and shipments abroad.

Labour Alliance.

The scheme of the Miners' Federation for an alliance between themselves, the engineering, railway, transport workers and other unions does not appear to be making rapid headway. Discussions are still proceeding; and later on there is to be a combined conference of all the unions. One difficulty is that making common cause to support the programmes of some of the unions would inflict injury on the industries that give the members of other unions employment. However, even that firebrand, Mr. A. J. Cook, the Secretary of the Miners' Federation, says he will be no party to leading the miners out alone. The Industrial Secretary of the National Union of Railwaymen (Mr. C. T. Cramp) says he will not be prepared to enter into any binding alliance without the full consent of the rank-and-file. He is wise. Schemes which emanate from the Communists should be scrutinized with the utmost care in order to ascertain to where they may lead, if accepted. We are inclined to think—in fact, we know—there are many members of trade unions who resent the influence the Communists are wielding in the policies of their organizations.

PERSONAL.

The General Managership and Chief Engineership of the Commercial Gas Company.

In consequence of the responsibilities arising out of the death of his father, the late Mr. H. E. Jones, Mr. Stanley Hunter Jones, M.Inst.C.E., has resigned his position as Engineer and General Manager of the Commercial Gas Company as from the 30th inst. The Directors of the Company have elected Mr. Jones to a seat on the Board as from May 1 next, and have appointed Mr. Frederick John Bradfield, F.C.I.S., the present Secretary and Accountant, to be General Manager and Secretary, and have also appointed Mr. Archibald Edgar Williams, A.M.Inst.C.E., at present Works Engineer of the Stepney Station, to be Chief Engineer of the Company.

This month Mr. John Bond, O.B.E., completes 21 years' service as Manager and Engineer of the Southport Corporation Gas-Works; and in honour of the event a series of presentations was made to him last week. On Wednesday the staff and men at the works paid their tribute; and on Friday the staff and men of the distribution department made fitting recognition of the occasion. At the works gathering there were about 100 employees present. Mr. T. Cook (Deputy Engineer) occupied the chair, and was supported by Alderman E. Trounson, J.P. (the Chairman of the Gas Committee), Councillor J. E. Hindle (the Vice-Chairman), Mr. T. Halsall (Commercial Assistant), and Mr. Russell Johnson (Chief Clerk). Mr. Cook, Mr. Halsall, and Mr. Johnson had acted as Chairman, Secretary, and Treasurer respectively in getting together the necessary funds for the presentation. The Chairman said the meeting had been called that they might all have the opportunity of showing their appreciation of their Chief. The technical staff fully appreciated that Mr. Bond was always ready to give a hand to the junior members, to assist them to rise to the higher rungs of the ladder. The men who had left their works to take up senior and junior appointments in other works owed their all to Mr. Bond for his valuable help. They were very pleased to have Mrs. Bond with them that afternoon, and he was sure she must feel very proud of the occasion. Mr. Halsall reported that he had received telegrams of congratulations to Mr. Bond from the following gentlemen who had previously served at Southport under him: Mr. J. E. Blundell (Gas Engineer, Carlisle); Mr. S. E. Whitehead (Assistant Gas Engineer, Portsmouth); and Mr. Leslie Smith (Assistant Gas Engineer, Macclesfield). Mr. Russell Johnson made the presentation; the gifts consisting of a gold fountain pen engraved, a smoker's cabinet, and an attaché case. Mr. Johnson congratulated Mr. Bond, and assured him of the good feeling that had prompted the gifts. Alderman Trounson declared that he never envied a man more in all his life than he did that afternoon. Mr. Bond had that which all men prized beyond money. Mr. Bond said he felt overwhelmed with his reception. He appreciated greatly their friendship, and sincerely thanked them for the lovely presents. Mr. Philip H. Christian (Outdoor Superintendent) presided over the second function, at which, after further interesting speeches, Mr. Samuel Rigby (the oldest employee of the distribution department) asked Mr. Bond's acceptance of a choice dinner gong. Mr. Bond acknowledged the very handsome present.

The Directors, staff, and employees of the East Hull Gas Company have presented Mr. Boswell George Jalland, J.P. (the Chairman), with a suitably inscribed gold cigarette box, as a mark of their esteem and goodwill, on his completion of

fty years' service as a Director of the Company. The pre-entation was made by Mr. George Taylor, one of the oldest mployees, who was supported by Mr. Richard Nelson (the eneral Manager and Engineer) and Mr. Charles M. Jackson a Director) in voicing the affection and esteem in which the Chairman is held by all. Mr. Jalland expressed great pleasure n the cordial relations which have always been maintained be-ween the Company and the employees.

Mr. John W. M'Lusky, Engineer and General Manager of he Glasgow Corporation Gas Department, and Mrs. M'Lusky, re sailing from Glasgow, on the 24th inst., by the C.P.R. .s. "Mountlaurier" for the United States. Mr. M'Lusky will isit upwards of a dozen important gas undertakings, and finish n New York, where he will, if arrangements are fulfilled, meet Ir. L. Hislop (late of Uddingston), who is on a world tour vith his wife and daughter. It is expected that the party will eturn together to Liverpool in the s.s. "Adriatic," *ex* New ork June 20. All good wishes for an informative and bene-cial tour.

Newly elected members of the Society of Chemical Industry nclude Mr. Frederick J. Bywater, of Alnmouth, Northum-erland; Mr. Frederick C. Bishop, of the Blackwell Colliery oke Ovens, near Alfreton; and Mr. Frederick T. Hatswell, fitchell Main Colliery Coke Ovens, Wombwell.

At the recent annual meeting of R. & J. Dempster, Ltd., of lanchester, it was decided to appoint additional Directors to he Board. Mr. H. S. Knight, General Manager, Mr. J. W. cott, Outside Chief Engineer, and Mr. W. R. D. Perkins ere elected.

Mr. R. G. Luxon, Engineer and Manager of the Launceston as Company, is shortly vacating that post in order to take up n appointment in Guernsey.

Mr. John Whitaker, who has just retired from the post of ndoor Superintendent of the Bradford Corporation Gas Depart-ent, after over forty years' service, and has been the recipient f various presentations from the Gas Committee and his col-agues in the department, was last week made yet another pre-entation, this time from the members of the Bradford Muni-ipal Golf Handicap. It was a solid silver flower vase, and the unction was presided over by Mr. E. J. Sutcliffe, Deputy Gas ngineer, who, like Mr. Whitaker, is a keen golfer. The pre-entation was handed to Mr. Whitaker by Chief Officer J cott, head of the City Fire Brigade.

Mr. R. B. Hodgson, of Stockton, has joined the Board of he Whessoe Foundry and Engineering Company, Ltd., of Dar-ington, and been appointed Managing Director. Mr. Hodg-on is well known in the gas industry and in general engineer-ng circles of this country, and has for some years been Director nd General Manager of Messrs. Ashmore, Benson, Pease, & o., Ltd., of Stockton-on-Tees.

Mr. W. E. Brock, late representative for Messrs. James Milne Son, Ltd., has joined the staff of the Wellington Tube Works, td., of Great Bridge, Staffs., as Outside Representative.

OBITUARY.

A most impressive funeral marked the interment on Satur-ay last of Mr. Henry Ellison, founder of the firm of Henry llison, Ltd., well-known in the gas, chemical, mining, and llied industries. Seventy-seven years old, the deceased gentle-an was in his customary good health up to last week, when e had a seizure. A man of remarkable business judgment, Ir. Ellison founded or assisted many enterprises, in addition o his own firm, which was started in a humble way in Cleck-eaton. Among many concerns with which Mr. Ellison was rominently associated, mainly as Chairman of Directors, ere the following Gas Companies: Royston, Brodsworth and istrict, Beighton, Dinnington, Maltby, Bawtry, Whitwell, and horne.

The death took place on April 4, at the age of 77, of Mr. William Corbett, of Cherry Lea, Bromsgrove. At the time of is death he was a Director of the Bromsgrove Gas Company.

Mr. A. B. Beetles, Outdoor Superintendent at the Lytham-t. Annes Corporation Gas-Works, died suddenly on April 3.

Sympathy is extended to Mr. J. P. M'Crae (Assistant ngineer to the Derby Gas Light and Coke Company), who has ad the misfortune to lose his mother, who was the widow of Ir. John M'Crae, for some time Engineer and Manager to the undee Gas Commissioners. Mrs. M'Crae died at her resi-ence, "Rosemount," Crail, on the 26th ult.

Southern Association Bournemouth Visit.—We learn from the on. Secretary (Mr. H. C. Smith) that the visit of the Southern ssociation of Gas Engineers and Managers to the works of he President (Mr. Philip G. G. Moon), at the invitation of the hairman and Directors of the Bournemouth Gas and Water ompany, will take place on Friday, June 5. A joint meeting the Districts will be held the previous afternoon in the ime town.

THE COKE COMPETITION.

One Thousand Pounds in Prizes.

The full particulars of the Coke Competition appeared in our issue for Feb. 18, together with the conditions, and explanatory and editorial articles. The £1000 to be distributed in prizes has been placed in the hands of the Editor of the "Journal" by the Woodall-Duckham Companies, solely with the view of developing the interests of the gas industry by accumulating all knowledge, results of research, and suggestions which will assist in raising the status of coke, qualitatively and commercially. With this act of generosity, the Companies referred to retire from all participation in the organizing of the competition or in adjudicating upon the papers which will be submitted. The whole matter was at the outset placed completely in the hands of a Committee, composed of Mr. A. W. Smith, General Manager and Secretary of the Birmingham Corporation Gas Department, Mr. W. B. Leech, Engineer of the Beckton Gas-Works (Gas Light and Coke Company), and the Editor of the "Journal" (Mr. A. F. Bezant).

Briefly it may be stated that the competition is divided into three Sections:

COKE PRODUCTION.

SECTION I.—A paper dealing with the Manufacture of Coke of the most suitable qualities for Domestic and Industrial Purposes; as far as possible including the Cleaning and Blending of Coals, or Coals and Coke, their Carbonization, and the Quenching of the Coke—due regard being paid to the economic requirements of gas production and the value of the other secondary products.

COKE PREPARATION.

SECTION II.—A paper on Coke Preparation, to include Screening, Grading, Conveying, and Storing of Coke.

SALE AND UTILIZATION OF COKE.

SECTION III.—A paper on the Sale, Distribution, and Use of Coke, both for Domestic and Industrial Purposes, at Home or Abroad.

The papers must be separate for each Section, but any competitor may enter for one or more Sections.

PRIZES.

The following Prizes will be awarded:

SECTION I.		
First Prize	£200	
Second Prize	75	
Third Prize	50	
Twelve Prizes of	10	each.
SECTION II.		
First Prize	£100	
Second Prize	50	
Third Prize	25	
Ten Prizes of	10	each.
SECTION III.		
First Prize	£100	
Second Prize	50	
Third Prize	25	
Ten Prizes of	10	each.

The competition is open to the men of the gas industry of the whole world, and to others who have anything valuable to say—always bearing in mind that gas is the staple commodity of the industry. Thus there is no restriction as to competitors. Those to whom the prizes may not appeal, but who have anything of value which they can contribute, the Committee earnestly ask them to do so in the interests of the industry, the highest welfare of which all associated with it in responsible positions should have at heart.

There are rules to be observed in submitting papers; and they will be found clearly set forth in our issue for Feb. 18.

If any further information is required regarding the competition, a letter addressed to the Editor of the "Journal" will secure it, providing the points are specified on which the additional particulars are desired.

Riveter for Holder Cups.—The Hanna Engineering Works, of Chicago, have recently placed upon the market a riveting machine designed specially for use in connection with gasholder cups, which consist of a channel and two plates—one wide and one narrow. The plates are riveted on the flanges of the channel. The cup section itself is a cumbersome piece; and the riveter being the easier of the two to handle, is used in portable form. The riveter should be as light as possible, and with this in mind a special frame was developed known as the "true truss design." The machine has a 42-in. reach, and a 12-in. gap. The cylinder diameter is 10½ in., and it is capable of exerting 30 tons on the dies at 100 lbs. air pressure. In this machine is incorporated the Hanna patented mechanism, which develops a predetermined pressure uniformly throughout the last half of the piston stroke, or the last ½ in. of rivet die travel.

SAFETY OF GAS FIRES IN REGARD TO CARBON MONOXIDE.

By Leonard Hill, M.B., F.R.S., and T. C. Angus, D.F.C.
(From the Department of Applied Physiology, National Institute for Medical Research.)

[Published in the "British Medical Journal," and reprinted by permission of Dr. Leonard Hill.]

At times alarm has been expressed in connection with the use of gas fires as to the probability of chronic poisoning arising from inhalation of carbon monoxide. In a pamphlet published recently by a medical officer of health of a large city, and circulated at the recent Smoke Abatement Conferences, this view was put forward definitely, but without supporting evidence.

We thought it worth while, then, to carry out a few experiments to see whether we could put this fear at rest and remove any antagonism against the wider use of smokeless fuel which is necessary in order to secure freedom from smoke pollution of the air and an adequate supply of the health-giving ultra-violet rays. Carbon monoxide has no poisonous effect other than that of combining with hæmoglobin and depriving the tissues of oxygen.

Blood taken and diluted to 1 in 200 parts of distilled water afforded a standard transparent solution of hæmoglobin. When placed in a narrow test tube of the Gowers-Haldane hæmoglobinometer and viewed against a white background by daylight, it appeared yellow-red, as is characteristic for this dilution and width of containing tube. Saturated with carbon monoxide by shaking with coal gas, the tint of the solution under the same conditions is carmine. Partial saturations vary from the yellow-red very slightly tinted with pink up to the full carmine colour.

Experiment 1.—A balloon was filled with a measured volume of air by means of a blower fan and meter, and enough coal gas introduced to give 1 in 1000 parts of air. A sufficiency of the standard solution of haemoglobin was placed in a tube 6 in. long and 1 in. in diameter, which at each end was closed by a cork through which a narrow tube was inserted. The tube was held horizontally so that the solution of haemoglobin lay from end to end along its floor exposed in a shallow layer to air above, which was drawn through the tube in a steady stream through the narrow tubes, one of which was connected to the balloon, while the other was suitably attached to a suction fan driven by an electric motor. During half-an-hour 670 litres of air from the balloon was drawn over the haemoglobin solution. On comparison with the control solution (kept in pure air) this solution gave a just perceptible change in tint, indicating a very slight formation of carbon monoxide haemoglobin.

Experiment 2.—Two parts of coal gas per 1000 of air were then put into the balloon, and the experiment was repeated. After thirty minutes a slight but quite definite carmine tint was clearly seen on comparison with the control.

Experiment 3.—The experiment was now arranged so that air was drawn from the neighbourhood of a gas fire, a position being chosen where a person's face would be who sat down by the side of a fire in order to warm his legs. The gas fire, 12 in. wide, was of the modern type and properly flued, being built into a chimney, and was turned full on. During one hour 760 litres of air were drawn over the standard haemoglobin solution. No perceptible change in tint resulted. The solution was reintroduced, and the experiment continued for another eighty minutes. No change in tint resulted after 1304 litres in all had been drawn over the blood. A resting man breathes on the average about 6 to 7 litres of air a minute, or the above amount in a little over three hours. More air was, then, drawn over in the two hours and twenty minutes' observation than a man would breathe.

Experiment 4.—An experiment was arranged so that air, in place of being drawn over, bubbled through the standard haemoglobin solution contained in a flask. In this case the rate of ventilation was about 150 litres an hour. The air was drawn from the neighbourhood of another gas fire of similar type and properly flued, but in a different room. No indication of carbon monoxide escaping into the room was found in this case.

Experiment 5.—This experiment was repeated on a windy day, when possibly there might be some down-draught in the flue. No evidence of carbon monoxide was obtained.

Experiment 6.—The experiment was repeated on a gas fire arranged in the grate of an ordinary open fireplace; the fumes from the fire escaping up the open chimney above the fire. No evidence of carbon monoxide escaping into the room was obtained.

Experiment 7.—The experiment was repeated with this variation, that a door adjoining the gas fire was set open to create a draught between door and window across the neighbourhood of the fire. The result was negative.

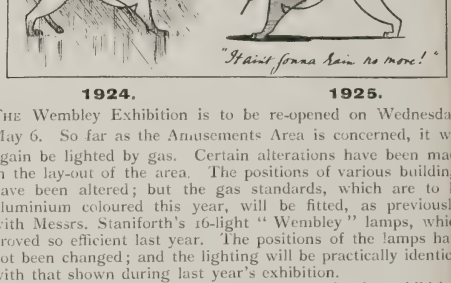
Experiment 8.—The experiment was repeated and varied by placing a small electric fan to blow across the gas fire to where the inlet to the sample tube lay. The fan blew across the warmed strata of air which lay in front of the fire, and this warm air was perceptible to the face when placed near the inlet tube, and gave one at once a stuffy feeling. No evidence of carbon monoxide escaping into the room was found even in this extreme condition of artificial side draught, which might be expected to blow fumes into the air.

Experiment 9.—To make the conditions as severe as possible, four *flueless* gas stoves of various types were placed in a small room about 12,000 c.ft. in capacity, and the door and window closed. The stoves were lit, and a mouse was placed on the table in the room. After two hours the temperature of the air at head level was 100° Fahr. dry bulb, and 87° Fahr. wet bulb; and on entering the room, one felt it at once stuffy. The mouse's blood showed 16½ p.ct. of carbon monoxide haemoglobin.

The difference between the inside and outside temperatures set-up enough natural ventilation through the crannies of door, window, and up the chimney to prevent very serious contamination of the air with carbon monoxide in this extreme case, showing how small is the amount of this gas arising from bunsen flames burning in modern gas fires. The touch of heated air to the face on entering such a room is unpleasant, while the breathing of the heated air, which contains traces of sulphur acids, congests the nose and gives a stuffy feeling. At the same time, cold feet may arise from the draught; cool air entering beneath the door. Gas fires should, then, always be properly flued.

No flueless gas burners or stoves should, of course, be used in *sealed-up* places where natural ventilation is almost *nil*. In such sealed-up places carbon monoxide may collect in dangerous amounts if cold surfaces are brought in contact with bunsen gas flames so as to check combustion.

BRITISH EMPIRE EXHIBITION



1924. **1925.**

The Wembley Exhibition is to be re-opened on Wednesday, May 6. So far as the Amusements Area is concerned, it will again be lighted by gas. Certain alterations have been made in the lay-out of the area. The positions of various buildings have been altered; but the gas standards, which are to be aluminium coloured this year, will be fitted, as previously, with Messrs. Staniforth's 16-light "Wembley" lamps, which proved so efficient last year. The positions of the lamps have not been changed; and the lighting will be practically identical with that shown during last year's exhibition.

With regard to the use of gas generally in the exhibition, practically the whole of the cooking at all the restaurants, cafés, &c., will be done by gas. There will be additional restaurants; and in these a very full gas equipment is being installed. Some of the other alterations which are taking place are: Larger supplies to Messrs. Carsons, who will be installing a Bonecourt boiler of considerably greater capacity; additional kitchen to Ceylon, where gas is being exclusively used for all hot-water and cooking; further supplies to British Guiana, and to Messrs. Barnand's, Messrs. Poppett's, &c., in the Palace of Industry, as well as to the Anglo-Indian section; and considerably greater supplies to Messrs. Baker Perkins, who are installing bigger ovens this year. A new service has been run to the South African exhibit, together with a number of other supplies in various places.

The original gas installation—including the 12-in. circuit main, with two station meters—still remains; and it is expected that the amount of gas used in the exhibition this year—subject, of course, to the prevailing conditions of weather—will be as much as, probably greater than, the requirements of 1924. All this apart from the Gas Exhibit, to which several references have appeared in the "Journal."

Coke-Oven Gas in France.

In a communication recently made to the Société de Chimie Industrielle, M. C. Berthelot draws attention to the fact that the French production of metallurgical coke, which amounts to about 3 million tons a year, corresponds to only one-quarter of the national requirements. The use of coke-oven gas for town use, he says, is therefore to be encouraged. He compares its use in France with that in Germany, where from 1903-21 the consumption increased from 500,000 to 31,000,000 cub.m.; in the United States, where the quantity has advanced from 607 millions in 1910 to 6075 millions in 1920; and in Belgium, where the towns of Brussels, Liège, Ghent, Mons, and Ostend are supplied wholly or partially with coke-oven gas. The gas should be purified before it leaves the works. The reason why this is not the present practice, he suggests, is because of the expense of oxide purification; and he thinks it would be better if wet purification was resorted to. The latter system is applied in 26 American installations for the daily treatment of more than 8 million cub.m. of gas. This process is to his mind an improvement—technically and financially—on oxide purification.

ELECTRICITY SUPPLY MEMORANDA.

Facts and Fancies.

The conferences on Electrical Salesmanship, as arranged by the Electrical Development Association, have ended for the present session. The last one was devoted to the consideration of a paper by Mr. R. Hardie, of the Glasgow Corporation Electricity Department, on the "Development of Electricity Supply in Residential Areas." In large part the paper advocated, relying upon recent experience in Glasgow, the adoption of hire-purchase for the wiring of houses. Although the electricity supply industry will not openly acknowledge the fact, they have had to resort—having obtained the easiest gained business—to countless methods for the purpose of influencing other people to adopt, even in a small way, the use of their commodity. This fact is rather a contradiction of the claims as to the pre-eminent virtues of electricity for domestic lighting and heating, though, as consumers well know, the really pre-eminent characteristics of electricity supply, particularly for heating and cooking, are the costs from installation to daily running. It appears that the main object in Glasgow of adopting the hire-purchase of wiring installations is to get in the thin edge of the wedge with lighting, and subsequently to attempt to effect the conversion of householders to the uneconomies of electric heating and cooking. Mr. Hardie says that in Glasgow they have calculated that the allotment of household expenditure in an average five-apartment house is £3 for electric lighting per annum, £6 for gas, and £10 for coal. We are obliged to Mr. Hardie for this allocation, in view of the fact that gas is only responsible for twice as much expenditure as electric lighting. Seeing that the application of gas in such a house is for cooking purposes and probably occasional room heating, and that the hotplate of the gas-cooker is very largely used for hot water provision, an expenditure of £6 a year, or 2s. 3d. per week, which is less than an average of 4d. per day, is something upon which we can pride ourselves, having regard to the extensive use which is made of the gas-cooker from early morning to last thing at night. The hotplate of the electric cooker would refuse to perform similar services without running away with a considerable amount of thermal energy. It is clear, too, that for electric lighting something like saturation point has been reached among householders who are willing to bear the cost of a wiring installation. Hence it is that it is necessary, in order to penetrate the strata beneath, for electricity departments to indulge in schemes whereby the wiring can be carried out by means of easy payments. The great difficulty in this connection is that even hire purchase will persuade but few tenants to adopt electricity, inasmuch as the wiring for which they are paying will, if in fit condition to be used when they leave the house, become the property of the landlord. Mr. Hardie describes this realization of new custom in fresh strata as "the problem" of obtaining new customers for lighting; and he admits that this is a most pressing task. We are not grieved to hear it.

Littleness.

To the reader there appears to be something pompous in Mr. Hardie's remark: "I have acted on the assumption that my work is to sell electricity without regard to the effect on the gas undertaking." How dreadful! We have not the slightest doubt that, without shouting it from the housetops, the men connected with the sales of gas in Glasgow are animated by precisely the same feeling of developing the sales of their commodity without regard or affection for the Electricity Department; and they are doing it. But we must protest against the remark of this electrical salesman: "Yet to-day, when electricity is at last beginning to live down the gross mendacious misrepresentation of the opposing vested interests and is making headway, there is a change of front impending." Mr. Hardie cannot know the history of things or he has been blind, or must possess an incapacity for discriminating between mendacity and truth if he does not know that the mendacity and slander that the gas industry formerly received from persons representing electric interests were such that even prominent men in that industry protested against the extravagance of language and claim. In addition to hyperbole, there is humour in a succeeding point which Mr. Hardie presents. He says: "If, as has been proved, gas need not for any purposes be laid into a modern dwelling-house, why incur further capital expenditure in laying gas mains and piping houses for a service which no one outside the gas industry will tolerate?" There was surely no occasion for the "if," seeing that Mr. Hardie is of opinion that gas is a service which no one outside the gas industry will tolerate. Did ever anyone read such rubbish, in view of the magnificent increases in gas consumption that the gas industry has been experiencing the last few years? These increases have not been obtained within the gas industry, but are produced by the patronage of the householding population of the country without identity with, or interest in, the industry in any way other than that of being glad to have the service of a labour-saving heating agent which is far more economical than anything electricity can offer them. Mr. Hardie's knowledge of even the elementary economics of the matter appears to be somewhat deficient. If this is the sort of thing that is to be presented at these Salesmen's Conferences for educational purposes, then it is a great pity, in the interests of an important industry such as that of electricity supply. These conferences are held under the auspices of the Electrical Development Association. We should like to know whether Mr. Beauchamp subscribes to the statements to which we have called attention. However, what the population of the country really thinks of the two commodities is well shown by Mr. Hardie himself, when he states that a year ago the Glasgow Electricity Department had 14,500 domestic consumers, while the Gas Department had upwards of 200,000 whose premises were lit by gas—electricity representing roughly 8 p.ct., with the average for London and the United Kingdom about 10 p.ct., or at most 15 p.ct.

The Scheme.

The wiring hire-purchase scheme outlined by Mr. Hardie has not been in existence many months. It offers to the householders the wiring of their houses with the payment spread over three years. It is explained in the paper that the majority of Glasgow people reside in what are known as tenement houses with, in each of them, eight to twelve possible consumers, who can be supplied from one service cable. Such a condition is naturally attractive from the supply authority's point of view. The Department's branch terminates at a point about 3 ft. from the entrance; and from there they endeavour to get the proprietor to instal a main rising cable to the top flat, complete with junction boxes on each flat, from which ultimately all the tenants may, should they so desire, obtain their supply. The usual cost of this work is £9. There the proprietor finishes his part. In the six months ending February, rising cables were installed at the proprietors' expense for upwards of 200 tenement houses, which means that facilities are now available for something like 2000 tenants "when they so desire." Of course, the interior wiring has to be carried out at the tenant's own expense; and there the trouble begins for the Department, in view of the fact that the tenant, being undecided as to his length of tenure, and disinclined to spend money on wiring another person's property, is not easily persuaded to incur the outlay. Nevertheless, Mr. Hardie states that, in the six months, 650 tenants have wired their houses, the majority of whom would probably not have done so in the absence of the scheme. Having regard to the population of Glasgow, Mr. Hardie acknowledges that this is an insignificant number, but he does not think it is altogether discouraging, having regard to the obstacles. In his opinion, too, it is probably correct to assume that the first 1000 consumers are the most difficult to obtain in a novel scheme. We do not think that is the common experience. Generally speaking, as has been found in connection with electric cooker installations, the first few hundred people who are attracted by novelty are easier to secure than subsequent hundreds; the tendency is for the new connections to tail off. As to tenant's cost: For a two room and kitchen house with five lights and two plugs for connecting electric fires (which can be hired), the price is £8 10s. if cash is paid, or £9 10s. if payment is spread over three years, in twelve quarterly amounts. For three rooms and kitchen, with six lights and two plugs for electric fires, the cost is £10 if paid in cash, or if spread over three years £11 6s. For four rooms and kitchen, with seven lights and two plugs for electric fires, the cost is £12 if paid in cash, or if payment is spread over three years £13 14s. These figures include cord pendants and lamps. If three-light or other superior fittings are desired, these are sold as an extra by the contractor. That is the scheme, and while we congratulate the Electricity Department on what has so far been done with wiring hire-purchase, it must be recognized that the conditions of Glasgow are not commonly found elsewhere; and it is very doubtful whether future experience as to the accretion of this class of custom will bring the same degree of satisfaction. Pretty certain it is that the class of tenants in these houses will not be able to afford much in the way of electric heating and cooking.

Which is the Jumpy Therm?

The Weymouth Corporation have been holding an electrical exhibition. The Gas Company have been doing some excellent propaganda work in the local papers and otherwise for their primary commodity. The electric exhibition is intended to be an answer to this. At the opening of the exhibition, some things were said which have to be proved; and a good many things were left unsaid, which shows discretion on the part of the electrical purveyors. The business propaganda of the Gas Company was referred to at the opening of the exhibition by Alderman T. J. Guppy, the Chairman of the Electricity Committee; and he attributes it to the "jumpy therm." A local newspaper in a headline alluded to the Alderman's "humour," which suggests that we ought to laugh over the "jumpy therm." Perhaps it will surprise the Alderman to learn that we did so, because it is positively certain that both the therm and the Gas Company's propaganda have given him the "jumps." Another matter over which we smiled was the omissions in his speech. One thing he did not tell the public was that it requires 29 units of electricity to equal the potential

heat energy in one therm. The price of electricity for heating and cooking in Weymouth has been reduced to 1½d. per unit; and the price per gas therm is 10d. Therefore, to obtain an equivalent amount of heat, 3s. 7½d. must be expended on electricity, as against 10d. for gas. Why did not Alderman Guppy state this? He might also have illustrated the matter another way. At 10d. per gas therm, 15,000 B.Th.U. can be purchased for 1⅓d. An electrical unit being equal to 3420 B.Th.U., 4⅓ units would have to be purchased at an expenditure of 6⅓d. to equal the potential heat purchasable for 1⅓d. by gas—in other words, 1⅓d. spent on gas will give 15,000 B.Th.U., as compared with 3420 B.Th.U. by electricity. The Alderman will see that in these differences there is an advantage on the side of gas which must give the Electricity Department violent "jumps" if they want to get hold of a substantial cooking and heating load; and the "jumps" would extend to the consumers when they received their accounts for current consumed for these purposes. When the good people of Weymouth consider those things which Alderman Guppy did not disclose to them, they will want to know what he meant by the words: "An exhibition of electrical energy for cooking and other things as come within the region of everyone." The passage is not happily phrased, and it is untrue. Also what was the justification for his saying: "We will leave it to the demonstrators to show you we can cook and give you other facilities in better form so that the people of Weymouth can enjoy the benefit of electricity." There is more to be learned by the user about electrical operation for any heating purpose than the mere employment of the appliances. Experience is apt to produce nasty shocks—of a monetary and time absorbing character. The appliances may be very fine to look at; but it is impossible to get more heat out of the electrical unit than it contains. Such generalizations as were used by Alderman Guppy in his speech do not prove anything.

Imitation.

Some electrical journalists ought to be on the staffs of papers which purvey frivolity of varied quality to their readers, rather than be associated with technical papers. Imitation, we are told, is the sincerest form of flattery. If this be true, then the writer of "Cooking and Heating Notes" in the "Electrical Times" thinks that compliments are being showered upon domestic electrical appliances by the gas rivals. Naturally, there has been interest and amusement in investigating what is said in support of this. It is found that the writer of the notes in question is as lamentably ignorant regarding the history of gas appliances as he is incapable of making proper comparisons between gas and coal heating, as was seen in our editorial columns on March 18, under the heading of "Electrical Arithmetic." Among the supposed feats of emulation he mentions the pneumatic gas switch, the gas "bowl type" fire, and the gas imitation coal fire. As to the last-named, they were on the market long before imitation electric coal fires were there, which are one of the biggest jokes ever played upon the public by an industry which seems to be fond of practical joking, and playfully calls it "business." As to the pneumatic switch and the gas "bowl-type" fire, these are merely instances of the large range of adaptability possessed by gas. But the writer in our contemporary, unfamiliar with the history of things, charges the gas industry, among its more recent efforts, with the enormity of being copyists in respect of the outside heating of ovens. This is really funny, seeing that some of the earliest types of gas-ovens were heated that way; and it must be twenty years ago now that externally heated gas-ovens were on the market, and some substantial ones were installed in hotels, clubs, and other places in London. But we must excuse the electrical novices in these matters if they in their eagerness and ignorance make mistakes of this kind. It may seem curious to our electrical friend that the public never took very kindly to externally heated ovens; and with all the silly talk of the electricians as to gas fumes, the public, with comparatively few exceptions, stick to the internally heated oven. The ignorant accuser of imitation says that gas has copied external heating with a view to secure the same hygienic conditions as obtain in electric cooking. Now what does he mean by that? The most unhygienic conditions in cooking are to be found in an unventilated oven, where meat is being cooked in an atmosphere saturated with its own emanations. This must be a particularly unhygienic state when the meat retains the flabby condition to be found in a closed oven with a supersaturated atmosphere, and an unusually low cooking temperature.

Further Piracy.

Then this vain pretender to knowledge has some idea that thermostatic control has been adopted to deal with the variations of heat due to fluctuations of pressure in the mains. Thermostatic control has been in use many years in connection with gas-heated hot water apparatus; and its application to ovens is simply an extension of service from one form of apparatus to another, but it is only found in certain modern superior types of gas cooker. The idea is not by any means to deal with the supposed fluctuation of pressure; but the control can be set to any desired temperature—giving a temperature range of incomparable value contrasted with electricity—and, when that is reached, the gas supply is maintained at a level which will ensure the same temperature continuing as long as desired, despite heat losses through radiation, conduction, convection, or variations of atmospheric temperature external to the oven. Really laughable is the colossal assumption which the writer in our contemporary possesses as to the copying there has been by the gas people of electrical apparatus. Really the boot is on the other leg. To the electric cooker he says may also be attributed the separation of the hotplate and grill from the oven. Such separate construction may be found illustrated in very ancient catalogues of gas-cooking apparatus. But worse still—electric competition is credited with "frantic endeavours" to improve the "appallingly" low efficiencies of the gas hotplates. Does this strangely imaginative individual suppose gas investigation and progress would have stood still had it not been for electrical competition? The most pronounced ninny is generally the man who thinks other men are simpletons. The efficiencies of gas hotplates were low formerly, but, bad as they were, they were superior to the efficiencies obtained on the hotplates of electric cookers. Modern gas hotplates are showing efficiencies that are 40 to 50 p.ct. better than the old ones. Electric hotplates if they show when new about 40 p.ct. efficiency are doing well—for such contrivances, which unfortunately show marked alacrity in departing on their downward career. And talking of efficiencies, it must not be overlooked that in London from 11,000 to 12,000 B.Th.U. can be purchased for a penny from the gas suppliers as against 3420 B.Th.U. from the electricity suppliers—where energy is 1d. per unit, which is not the case generally. More frequent figures are 1½d. and 2d. There are other suggestions as to "imitations" on the part of the gas apparatus makers, which are as unfounded as the rest of the childish assertions to which attention has been drawn.

WORKERS AWAKE!

A CORRESPONDENT has called our attention to an article by Mr. J. L. Garvin in "The Observer" for March 29. It is headed "Sleepers Awake!" Our correspondent thinks it should have been "Workers Awake!" Mr. Garvin points out that the industrial question is our one business of life and death, and that we shall either settle it, or it will settle us. He is of opinion that a movement has begun which will shake us out of our inveterate conservatism and our false composure, and compel all interests, including the Government, to grapple with the national necessity for economic reorganization. The conferences between employers and workers that are now taking place are touched upon, as well as the revelations of the times. The large part that labour plays in the present disastrous conditions of industry, and the part labour will have to take if we are to retrieve our position, are shown; and then there is this paragraph on "Work and Wages" which our correspondent thinks should be published in the "JOURNAL." It emphasizes points which have frequently been made in our editorial columns as to the interdependence of our industries, and as to the imperative necessity of the workers making their contribution to our industrial revival. There will be no substantial revival without. The paragraph reads:

Upon the situation as it stands, the first day of the shipbuilding conference threw some fresh light. It proved that the problem lies as much outside the shipyards as in them. "Shipbuilding," as the Chairman (Mr. John Ball) put it very clearly, "is governed largely by the cost of coal, steel, and engines." The syndicated federations in Germany to-day organize economy upon every link in that chain. There are five main things that we on our side have to face. The first is the basic problem of the price of coal. The second is the want of consolidation in the iron and steel trades. The third is that our "sheltered trades," like transport, building, municipal service, and so forth, are enjoying by comparison a parasitical growth, exempt from foreign competition. They are forcing up costs at the expense of our main productive and competitive employments upon which all the rest will depend in the long run. The fourth factor is that the suicidal rigidity of trades union etiquette in this country, as in no other, makes it impossible for the British employer as a rule to equal his German or American rival in elastic and economical organization. The fifth and gravest point for our industrial democracy is that hours abroad are longer and wages less.

Let us look at what is fundamental in these propositions. We do not believe that international legislation for a long period to come will be able to equalize wages by levelling-up, or hours by levelling-down. It is pretty certain instead that, unless the masses of the British nation make up their minds through and through that they must work harder, the standard of life and average prosperity cannot be raised again. All the professional classes, everywhere in Europe, have to work far harder than they ever did. The working classes will have to do the same if they are to achieve a better future and avoid a worse. Why is this an iron law? Why is there no escape from it? The answer is only too plain. We are doing less business in relation to our needs than ever before, except perhaps during the short severe phases of two or three commercial crises a hundred years ago. Yet we have a larger population. But the average output is not only less per man per day than it was before the war; it is positively less per man per hour. Foreign competition is wider and abler than ever before; and it is increasing.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

SPRING MEETING IN EDINBURGH.

THE Spring Meeting of the Association was held last Friday afternoon, in the North British Hotel, Waverley Station, Edinburgh. Mr. JAMES CAMPBELL, of Dunfermline, presided; and he was supported at the luncheon by Lord Provost Sleigh (Edinburgh), Bailie Stewart (Convener of the Edinburgh Corporation Gas Committee), Councillor Gregorson (Sub-Convener of the Edinburgh Corporation Gas Committee), Dr. E. W. Smith (London), Councillor J. M. Smith (Convener of the Dunfermline Corporation Gas Committee), and Messrs. J. W. M'Lusky (Glasgow), J. W. Napier (Alloa), G. Keillor (Greenock), W. M. Mason (London), H. H. Gracie (Edinburgh), and John Wilson (Motherwell and Wishaw). Nearly 200 members and friends were present.

LUNCHEON.

The PRESIDENT, in opening the proceedings, said the meeting had always been a very popular one with members of the North British Association. He supposed that to some extent its informal nature conduced to this popularity. That day, however, they were honoured in having as their guests Lord Provost Sleigh and other influential members of the Edinburgh City Corporation. Lord Provost Sleigh was an exceedingly busy man, and they were gratified that he should find time to join them.

Lord Provost SLEIGH remarked that he was delighted to be one of their guests, and had thoroughly enjoyed their hospitality. His first duty was to extend to all members of the Association a very hearty welcome to Edinburgh. The Corporation were always delighted when such conferences were arranged. He felt that he must congratulate the gas industry, because it had held its own in a magnificent way against a very strong competitor—electricity. He had personally taken a very great interest in gas affairs ever since he saw the light. He wished the Association all success.

Mr. JOHN WILSON (Motherwell and Wishaw), proposing the toast of "The Guests," took occasion, on behalf of the Association, to thank Lord Provost Sleigh for his kind words of welcome. Associated with the toast was the name of Bailie Stewart, the Convener of the Gas Committee in Edinburgh. In mentioning the name of Bailie Stewart, he believed he touched responsive chords in the hearts of all the managers present, because it was well known how earnest and hard-working the Edinburgh Gas Convener was in everything pertaining to the welfare of the gas profession. Wherever there was a meeting connected with the gas undertaking, there they would be sure to find Bailie Stewart.

Bailie STEWART, in the course of a brief acknowledgment, said they in Edinburgh were glad to learn of the progress that was being made by the gas industry throughout the country. As against electricity, there was no doubt that gas was more than holding its own. Year by year the industry was increasing and prospering. From personal experience, he knew the high qualifications that were expected from a gas engineer and manager; and speaking from first-hand knowledge, he was in a position to say that the work of management was splendidly carried out all over the country. His best wish for the industry was that it would continue to grow and prosper, and that the present-day members of the Association would continue to carry on the good work that had been satisfactorily performed by their predecessors.

The PRESIDENT reminded them that they had with them Councillor Smith, of Dunfermline, who, on behalf of that city, was, he believed, to deliver a message that would prove most acceptable to the members.

Councillor SMITH said it gave him great pleasure to be with them, as a representative of the Dunfermline Corporation and the gasworks of that city. It was with great satisfaction that the Town Council of Dunfermline learned that Mr. James Campbell, their Gas Manager, had been appointed President of the Association for the present year. Of Mr. Campbell he could say that he would make a good President. Whatever work he took in hand was certain to be carried out well. He believed it was the custom of the Association to hold the September meeting in the town in which the President for the year was professionally engaged. When that point was brought before the Town Council, they unanimously agreed to ask the Association to hold the autumn meeting this year in Dunfermline; and he extended a most hearty invitation to the members to do so. He could assure them that the members of the Town Council would do what they could to make the visit interesting, enjoyable, and memorable.

The PRESIDENT said they would gladly accept the invitation to hold the September meeting in Dunfermline. Speaking for himself, he was highly gratified by the enthusiastic way in which the Gas Committee and the Town Council as a body had taken up this invitation.

Dr. E. W. SMITH (London), submitting the toast of "The North British Association of Gas Managers," asked if there was any reason why the gas industry, with all its status, power, and ramifications, did not have more influence than it had in quarters that counted in London and throughout the country. To his mind, the gas industry was one of the finest commercial organizations to be found anywhere for propounding what it could do. In spite of this, however, the industry did not seem to be very effective in creating an atmosphere which would make people say "Let us have gas;" whereas they were saying, without having any idea of what it meant, "Let us have electricity." This was a state of affairs that had to be put right. This could best be done if everyone associated with the industry would proclaim its virtues. In the gas industry they had something which would stand on its own feet without having to run-down any rival or competitor. The present gas industry was infinitely better than the gas industry of fifty years ago. As a matter of fact, they were only now beginning to realize the possibilities. They had heard from Mr. Lloyd George—and others who knew as much about the subject as he did—that electricity was the solution of all fuel problems. On this point, his personal view was that there were no men in this country—quite apart altogether from their practical knowledge—who were in a better position to get-down to the fuel problem, and to make practical suggestions as to the methods of handling fuel, than those associated with the British gas industry. Why were they not doing it? It was not sufficient to say, "Use gas, and do not use electricity." They had to get-down to a co-ordinated scheme which would include gas and electricity, and which would embrace fuel-oil and coke-oven practice. They must show that, by the co-ordination of all these things, it was possible to produce power and heat at a very much lower price than the cost to-day. They must strive to show that it was the unnecessary competition between all these things which increased the costs of power and heat. At the moment the Leeds University were turning-out some extraordinarily good men—men who would make their mark in the future, and some of whom were already making their mark, in the various undertakings with which they were associated. They wanted, however, more and more to get scientifically-trained business men in charge of their larger gas undertakings—men capable of taking broad views, and who could handle things in a scientific and business-like manner. If it was not possible by atmospheric means to produce ammonia in a big way, then it could not be produced by any method as cheaply as by the gas industry. They must stress points like this all the time.

COKE POLICY.

In this connection, he might ask Mr. Mason what was proposed to be done at Wembley this year in the matter of the display of coke. On the subject of coke, he personally had very strong feelings. Indeed, he felt it was true to say that coke was a neglected bye-product of the industry; and that, too, in spite of the fact that it was in reality its biggest asset. It could be made a very much bigger asset still. Recently it had been effectively demonstrated in many ways that properly-prepared—graded and reasonably dry—coke could be used for domestic purposes; and it was being employed very largely for these purposes, both in the Midlands and in the South. He was quite satisfied that there was not a gas undertaking in the country, with coke available for sale, where it would not pay to give this matter of its preparation and exploitation the fullest possible attention. If managers would undertake to grade the coke and keep it reasonably free from moisture, there would be absolutely no difficulty at all in getting rid of supplies. Indeed, on this aspect of the question, he was personally prepared to guarantee that, in any particular district—given always, of course, proper plant—it was possible to ensure a complete sale of all the coke for domestic purposes. There was no difficulty about that at all, if the subject were tackled in the right way.

The PRESIDENT, with whose name the toast was coupled, remarked that there was reason for congratulation in the progress made by the industry during recent years. There was much useful work for the Association to do.

THE WEMBLEY GAS EXHIBIT.

The PRESIDENT said that at this stage he might call on Mr. W. M. Mason, of the "B.C.G.A.," to report progress in connection with the Wembley Gas Exhibit.

Mr. MASON, at the outset, expressed thanks on behalf of the Wembley Gas Exhibit Executive for being afforded this opportunity of telling the members what it was proposed to do in regard to the present year's exhibition. He went on to explain that the decision that the gas industry should be adequately represented at Wembley in 1925 was come to after most careful consideration by a representative meeting, when it was felt that every opportunity—both by striking display and wide-spread advertising—should be taken to demonstrate to the public the universality of gas as a fuel for domestic and business purposes. Growing competition—supported, unfortunately, by not very carefully thought-out political backing—was trying to make the public think that gas was a thing of the past. The Wembley Exhibit last year, and the splendid Press publicity which it secured—and which it was hoped would be repeated this year—did a great deal to prove that the gas industry was very much alive. That the decision of the leaders to go on with a National Exhibit this year was wise, was proved by the fine financial support to the scheme which had been forthcoming. Scotland, as usual, was not behind. The subscription list included, to date, the following contributions, as well as many smaller ones. Indeed, some of the small undertakings had actually sent in subscriptions of double the amount asked:

	£		£
Glasgow	1410	Greenock	50
Edinburgh	262	Alloa	25
Aberdeen	50	Falkirk	25
Dundee	50	Dunfermline	25

Among the smaller undertakings, he was delighted to report

that Callander, Burntisland, Kilbarchan, and Stranraer were "doing their bit" in regard to the exhibit; while burghs like Airdrie, Dumbarton, Greenock, Kirkcaldy, and Hamilton had either already contributed or were about to contribute their share of the expense. Something had been said by Dr. Smith relative to the display of coke at Wembley this year. At the moment, he (Mr. Mason) could not enter into the details of that; but he could assure them that there was to be a substantial exhibit of coke. The uses of coke from the industrial and domestic points of view would be fully demonstrated.

MAINTENANCE OF DOMESTIC CONSUMERS' APPLIANCES AND FITTINGS—ADMINISTRATIVE POLICY OF GAS UNDERTAKINGS.

By J. W. Napier, of Alloa.

The past five years have witnessed successful efforts towards co-ordination of the affairs of the gas industry—the legislative and administrative side, for which the National Gas Council stands; the advertising of the merits of gas, for which the British Commercial Gas Association exists. Unity is the aggregate value of the individual effort in reaching a common objective. Individualism provides the initiative; but in an industry serving the nation upon a higher basis of economics of fuel supply and industrial products, organized effort is necessary. In this regard not only is advancement sought for, but protection also—advancement in creating a better public service for the users of gas; protection of the interests of gas undertakings, interests that are unselfish and are of communal value and national necessity. Consumpt of gas is an important factor in costs of manufacture and distribution. The continuity and progress of the gas industry is at the consuming end of the business. It is highly essential, therefore, with this clear outlook, to embrace a commercial policy securing business by good maintenance of consumers' appliances.

Having this outlook before us—namely, organized administrative policy—it appears to me that this Association, representative of the gas industry in Scotland, should determine a plan of gas distribution practice for the acceptance of individual corporation and company owned gas undertakings. The Association have the power of influencing the administrative affairs of gas supply, and of directing a new policy. There are problems that are the better for slow growth, before being put into general practice. Maintenance of consumers' appliances is now ready for general adoption. Hitherto, discussion of the duty of maintenance has circled largely round lighting appliances, and consideration has been given to the preserving of the lighting load. It is intended in this short communication to include the whole service of domestic gas supply, to consider the subject in its entirety, and to state conclusions setting forth a definite policy.

Service Pipes.

In the course of my relations with a large number of undertakings throughout the country, I have observed wide differences in practice. There is the case where the proprietor is required to provide and lay the entire length of pipe, the gas undertaking simply providing the street main; and the more common example of the gas undertaking meeting the cost up to the line of street, the proprietor paying for the pipe laid in private ground. There are cases where the gas undertaking provides the entire length of pipe up to, and including the fixing of, the meter, and instances where the cost of piping in private ground is divided between the parties. To apply a rule of strict obligation and equity among consumers, the policy of the cost of pipe from the street main to the line of private ground being met by the gas undertaking, and all pipe laid in private ground being paid for by the proprietor, is justified, and may be held as good practice. Capital cost, and not maintenance, is here concerned. There is a distinct feature in continuing with the proprietors of buildings the duty of first cost. It preserves equity. In similar circumstances all parties are treated alike. With the completion of the service pipe, the responsibility of the proprietor may be said to cease; that of the gas supply authority acting in the interests of consumers begins.

After considerable experience, and, in particular, after making observation of the results of divided responsibility, my settled opinion is that, immediately the service pipe has been completed up to the meter, the gas undertaking should take it over, and accept for the future full maintenance, including replacement when required. The added cost, one year with another, as and when repairs and renewals occur, will not in my view be considerable. Against the added cost, the gas supply authority has single ownership over the entire service pipe. Dual control and responsibility cease. That there should be dual ownership stultifies the position of the supplier of gas in the endeavour to give satisfaction. It acts and re-acts as between the mutual interests of gas supplier and user. The inadequacy of a large proportion of service pipes in almost every gas supply area is undoubted; that this must be so is evidenced in the maximum demand of to-day for cooking and heating compared with the maximum demand of a lighting load only, for which many service pipes now in use were originally laid.

The question will naturally be asked, What of the many service pipes existing under the old policy? The answer is clearly that they be taken over and cared for in the same way. Owners of property are not likely to entertain objections. The gas authority has obtained complete control, and is therefore in a position to preserve aright the pressure and volume of gas up to the meter. This is one of the objectives, and the policy is commended to the gas industry for its intrinsic merits and values. It should be stated that, under the system now projected, the specification of quality and size of service pipe for all new properties will be entirely under the direction of the gas supply authority. Let me say, finally, in regard to administrative duty, that there is no obstacle in the way of municipalities working under the Burghs Gas Supply (Scotland) Act, 1876, adopting complete control of service pipes. In the case of undertakings having special Acts, there may be lack of direct or implied authority; but this is a matter easily remedied. With private company undertakings, no difficulty whatever exists.

Cooking and Heating.

Dealing with piping for cooking and heating appliances comprising fires, geysers, wash-boilers, &c., the tendency is that the gas undertaking carries out the work free of cost to the consumer. In these instances, maintenance is accepted, and no difficulty arises. In cases where the consumer is charged in whole or in part for the fitting-up of cooking and heating appliances, it is suggested that control of the piping for maintenance should be accepted. This should be an easily accepted responsibility, as the fitting-up of installations, if not actually carried out by the gas department, is usually directed by its officials. When the practice obtains of leaving the fitting-up of apparatus to consumers, there is uncertainty as to proper size of piping to be employed. Such practice spoils control, and maintenance is made more difficult. It is as much the duty of the gas department to ensure proper size of piping as to sell or hire-out efficient apparatus. Where this policy of non-control is allowed to continue over the years, there is a multiplying of inconvenience and dissatisfaction of consumers.

The justification of a gas undertaking expending money on piping inside private houses is naturally a subject requiring consideration. The evidences in favour are that, in doing so, additional use of gas is obtained for expenditure already incurred for the service pipe and meter; the piping, being determined by the gas supplier, is adequate; and there is good workmanship. As a result, maintenance is accepted. In addition, where fixing free has been the practice, results have shown that a greater number of consumers take advantage, and therefore a larger volume of business is done. Part of the expense of fixing in cases where appliances are sold outright to consumers can be met by a percentage amount being added to the net cost of the appliance. The opinion is freely stated by officials that asking consumers to pay for fixing in many instances retards progress in the use of gas for cooking and heating. The experience of the writer, looking back over a considerable number of years, in fixing all gas apparatus free, is that there is no desire to depart from the practice. The result has shown a high aggregate consumpt of gas per household per annum, and a price of gas to-day of 2s. 6½d. per 1000 c.ft.—*i.e.*, the rate of 3s. 2½d. *less* 7d. for electricity deficit. There will be many differing characteristics with the many gas authorities, but the policy of free fixing completes at once the control and maintenance of piping in consumers' houses in the supply of gas for cooking and heating requirements.

The absolute need of maintenance of cooking apparatus and of gas fires and other domestic appliances need not be elaborated. There must always be in front of us the fact that gas, by simple reason of its not being a single element of heat, but a mechanical compound of gases, demands in its consumption regulation of supply and inspection and cleaning of apparatus. Maintenance includes free inspection and regulation—replacement parts being charged in accordance with the policy of the undertaking concerned. There should be no distinction whether the apparatus is private property or on hire. In cases where cookers, for example, are supplied free or on hire-purchase terms, the cost of replacement lies, of course, with the gas department.

What difficulties, practical and financial, are in the way, preventing or retarding the maintenance of consumers' fittings and burners? There are none. There are occasions when it is best to free oneself of difficulties by not observing them. It is unnecessary to repeat the evidences in favour of maintenance. A new general policy should be accepted by the gas undertakings in Scotland, to be put into practice within the next twelve months. The best protection for the lighting load is a policy of maintenance.

A constructive policy requires to be defined. The gas undertaking will undertake the work of maintenance of consumers' lighting appliances. The technical knowledge and experience of the gas supplier enable the work to be done in the most satisfactory manner. The education of the gasfitter is a permanent institution of the gas industry, and he is now a technical expert. The gas department may seek the assistance of local gas-

fitters, but this is a policy for each undertaking to decide for itself. The organization of the work must originate in the gas department. A definition of maintenance is required. The appliances to be maintained are those in use, whether privately owned or the property of the gas department. Consumers should be advised as to discarding out-of-date and inefficient burners. They should be supplied with suitable burners, &c., at charges to be determined by each undertaking. Only the actual material supplied should be charged. The scheme should embody free inspection and cleaning. Each undertaking should select, and control the supply of, burners of recognized merit. This requires combination with local plumbers and gasfitters.

As regards the payment of maintenance service, there is only the one source—namely, the price of gas. Arising out of the trend of opinion expressed in this paper is the matter of equity as affecting the various classes of consumer. In all business legitimate expenditure is placed on the cost of the article supplied. Allocation of value to consumers is determined by a differential scale of charges. This refers more especially to large industrial users who benefit by low rates on the basis of quantity used. Large users of gas for domestic purposes can be given a scale of discounts.

My endeavour has been to stimulate an interest in the subject of maintenance, in order to hasten the general adoption of a policy. Time was when a low price of gas was the one end and aim in selling gas. Price alone, with the present-day mentality of the public, is no longer the substantial deciding factor it used to be. To-day the position is altered, and service is an essential duty. It is hoped that unanimity will prevail on this subject. It will be understood that I have left to Mr. M'Lusky the question of costs of service.

MAINTENANCE OF CONSUMERS' APPLIANCES.

By George Keillor, of Greenock.

A study of the history of gas supply in Scotland teaches us that the maintenance of consumers' gas appliances is not a new question. Forty years ago (to go no further back) the question was under discussion; and in certain enlightened quarters it had, even then, become the custom not only to give away flat-flame burners, but to clean bracket taps and swivel joints, and do other odd jobs without charging the customer anything for the work.

Thirty-three years ago a paper was submitted to this Association by my father, entitled "How to Keep Down Complaints and Grumbling among Gas Consumers." The following quotations are taken from this:

"Let your meter inspector be a man of sound mind and judgment, thoroughly trained in the distribution of gas, and able to discuss with customers *on the spot*, in a courteous manner, everything connected with gas supply, to hear their complaints quietly, say nothing but what is absolutely necessary, and certainly never show the least ruffle of temper or any unnecessary independence; after which make it a point to quieten the grumbler by, if possible, removing the cause of his discontent. . . . I have come to the conclusion that the real and only cure for this epidemic of grumbling is that the meter inspector must deal with all complaints on the spot; but whatever means may be taken, or at whose expense, nothing must be left undone that, in reason, will satisfy the consumer. And whatever or by whom it may be done, let it be superintended by the gas official; for who has greater interest in the gas that is being sold than the man who makes it? And is it not obviously for the benefit of all gas companies and corporations to keep in their own hands, if not the whole control of all internal fittings, at least the entire superintendence of the alterations and improvements in gas lighting when opportunities occur? . . . I hold that every manager should provide his officials with a stock of new burners of all sizes, to be given to all and sundry. And all who occupy the office of meter inspector and collector—who may be the manager himself in small gas-works—should be men thoroughly practical, and not only able to discuss the different systems of gas lighting with consumers, but also be of a straightforward and courteous disposition, with a strong aptitude to do good business in a real business fashion. . . . I say: Please consumers, and do good business with them; and you cannot fail to satisfy your directors. . . . In the age we live in, the gas man's independence is not how much superiority he can show over others, but only the independence gained by being able to satisfy the consumer with his goods. . . . It may be asked, 'How can a meter inspector have time to deal with such matters when on his inspection, and how is it possible to satisfy every person?' In this question lies the whole problem. But it is a problem, I am convinced, it will pay to solve, and one which after all is not very difficult of solution. It would no doubt add a few days, or even a week, to the time in making the survey; but is it not a fact that this man is, by the aid of the meter, selling our stock? . . . Competition in lighting is increasing, as in everything else; and to please our customers, our representatives must be courteous, long-suffering, patient, and practical."

About 32 years later we find Mr. Arthur Coe, in his interesting book "The Scientific Promotion of Gas Sales," giving publicity to similar sentiments, and pointing out that the value of the meter inspector had too long been under-estimated.

The idea of the principle of maintenance and salesmanship was born in those distant days, and the various statements submitted this afternoon bring the subject up to date. They indicate very clearly the advance we have made in principle and opinion, and also in the actual practice of organized maintenance. The evolution of the idea has been slow; but now that a practical solution has been found and described, it ought to be adopted immediately and universally.

In my opinion the present-day solution of the problem lies in the regular free overhaul of all gas-consuming appliances. But at the same time we should use our utmost endeavour to promote and retain the goodwill of every citizen. It should also be our endeavour to seek out and multiply points of contact between our servants and the public. An organized system of public service, humanely designed and administered, does this; and if we consider it to be our duty to guide and instruct consumers in the safe and economic use of gas, the road to success will be all the easier. The Gas Regulation Act, in fixing the responsibility for the adjustment of consumers' appliances as required for the efficient use of the quality of gas to be supplied, gives power to the industry and an impetus to the movement in favour of general maintenance.

The particular incidents which led to the adoption of an organized system of maintenance in Greenock need not be related. It is sufficient to say that fully three years ago a careful investigation proved (even to us) that the system in vogue—and it was considered a well-ordered one—did not fit in with modern requirements. Under the old system our public-service relations were fortunately above the average. We did a lot of free maintenance work, and encouraged our customers to think well of us in other ways, but points of public contact were few and far between and limited only to the "perky" counting-house clerk, the hustling, uninterested meter reader, and the soulless, untidy, tobacco-smelling gasfitter and pipe-layer. It was also known that our rivals made a door-to-door canvass of the district; and as they were none too particular as to the accuracy of the facts and figures they supplied to gullible householders, it was incumbent upon us, as business people, to follow them up and tell the people the truth.

Nowadays new customers are difficult to get; and it is easy to lose old ones. If old customers are dissatisfied with the service we give them, it is unlikely they will contemplate an extension of that service. If, therefore, we are to have repeat orders and additional sales of apparatus, it is obviously incumbent upon us to give absolute satisfaction with existing services. Having regard, therefore, to all the circumstances, and realizing that the systematic and regular free overhaul of consumers' appliances is *the* means of retaining custom and goodwill, and also the preparatory step to raising the standard of efficiency in the use of gas and the development of sales, I at once decided in favour of an organized system of maintenance. In a very short time the new system proved to be of inestimable value as a business and goodwill getter. In the free maintenance of consumers' fittings you have an Aladdin's lamp which, if properly used and exploited, will bring you much prosperity.

Hitherto, with no organized system of inspection, and having no regular and sympathetic contact with the public—contact which well-trained, intelligent, smart young inspectors and salesmen now provide—we were losing ground to our "slick" competitors. Now, however, with an organized system, it is the other way round; instead of losing customers we retain them and recover old custom as well.

I have given this subject a good deal of thought; and knowing, I hope, the needs of the industry, and how intense electrical competition has become, the sooner every gas undertaking—large or small—has an organized system of inspection in operation, the better it will be for all concerned.

Might I suggest that, though almost any system of maintenance is better than none, it is a mistake to superimpose a real live modern maintenance system upon an old-fashioned public service edifice. Therefore "plan before you act, and look ahead before you step." Before launching your system set up a real standard specification for services and for the canvassing of houses; see that the existing gasfitting and pipe-laying organization leaves nothing to be desired; be sure that the method of receiving and dealing promptly with complaints and new orders is foolproof; decide to sell at fair working profit only the best appliances, and make a suitable arrangement with plumbers, gasfitters, and ironmongers, so that they also may sell only the best, indeed what you recommend; encourage local traders to work with you, not against you; encourage them to look upon your showroom as their showroom, and try to make their shop windows your district showrooms, even if you give them a cheap supply of gas for window displays. Other points might be mentioned, but they are obvious even to the uninitiated.

With regard to showrooms, it is of the utmost importance that they be kept scrupulously clean, and representative of a real live service. Frequent changes in display are a necessity, otherwise a showroom loses its gripping power, and becomes lifeless. If advertising is indulged in, it should be judicious,

non-controversial, and truthful. Might I here utter a word of warning to the many small and medium-sized gas undertakings who are rapidly coming within the ambit of the linked-up electricity undertakings? Most of them are doing nothing to ward-off the advance upon their territory; and I am afraid that, unless managers are encouraged to proceed with works improvements and to engage in district propaganda, directors of companies and local authorities will have themselves to blame if business losses lessen profits. Incidentally, disgruntled gas consumers in badly-served districts do a tremendous amount of harm to the gas industry generally, and retard real co-operative advancement. Remember, "He profits most who serves best."

Particulars of our simple free maintenance scheme were recently given in a paper to the Scottish Salesmen's Circle by my Chief Assistant, and fully published in the "Gas Salesman" for Jan. 28.

All our public service employees, including maintenance men, meter readers, inspectors, gasfitters, foremen, showroom attendants, and the staff generally, work shoulder to shoulder. All our men are naturally enthusiastic, and I personally try to share the burdens of the men on the firing line: "It's dogged as does it; and nothing succeeds like success."

Our industry is of great national importance, despite the forgetfulness of the politician. Its manufactures are unexampled. Gas is an indispensable article of commerce. It is the cheapest form in which light, heat, and power are obtainable. Coal conservation, the achievement of a smokeless atmosphere, and better health for all are the aims of the gas industry, and all its actions from the scientific carbonization of coal to the promotion of gas sales and the teaching of the public in the efficient use of the gas consumed are actuated by these aims. This is surely something to boast about in these highly scientific, highly competitive times; and if we are to be true to our heritage and retain our place in the sun, surely something more is required of us to-day than a continuance of the talk which has been going on for thirty or forty years. Now we have all got to act; and I sincerely hope that this meeting will resolve unanimously in favour of the immediate adoption of free maintenance.

A contribution by Mr. J. W. M'Lusky, of Glasgow, together with the general discussion, will be published next week.

INSTITUTION OF ENGINEERS-IN-CHARGE.

Twenty-Fifth Annual Dinner.

That the Institution of Engineers-in-Charge, who were incorporated in 1923, are in an exceedingly flourishing condition was manifested by the crowded attendance at the twenty-fifth annual dinner—which took place last Saturday evening, in the Venetian Chamber of the Holborn Restaurant. Members are, of course, not everything in an organization of this character; but no one who was privileged to attend the function could doubt that the enthusiasm which is also necessary is present among the members in abundance.

The chair was occupied by Mr. T. Cooper, M.A.(Cantab.), M.Inst.C.E., M.Inst.Mech.E., M.Inst.E.E. (Engineer-in-Chief to the Metropolitan Asylums Board), the President of the Institution; the Vice-Chairman being Mr. C. A. Pickles, who is Chairman of the Institution. There were a large number of guests, the acceptances including Col. Sir Arthur Holbrook, K.B.E., M.P.; Mr. W. H. Patchell, M.Inst.C.E., M.Inst.Mech.E., M.Inst.E.E., Past-President of the Institution of Mechanical Engineers; Captain H. Riall Sankey, C.B., C.B.E., M.Inst.C.E., R.E. (Ret.), Past-President of the Institution of Mechanical Engineers; Mr. E. A. Sandford Fawcett, C.B., M.Inst.C.E., Chief Engineering Inspector to the Ministry of Health; Dr. Alex. Russell, M.A., LL.D., F.R.S., M.Inst.E.E., President of the Institution of Junior Engineers; Dr. W. R. Ormandy, F.I.C., F.C.S., President of the Institution of Automobile Engineers; Brigadier-General Magnus Mowat, C.B.E., M.Inst.Mech.E., Secretary to the Institution of Mechanical Engineers; Mr. Alcwyn A. Jones, President of the Institution of Heating and Ventilating Engineers; Mr. Leon Gaster, M.Inst.E.E., Secretary to the Illuminating Engineering Society; Mr. G. Stevenson Taylor, O.B.E., H.M. Senior Engineering Inspector of Factories.

Science and Industry.

Following upon the Loyal Toasts, Mr. W. H. Patchell submitted "Science and Industry." Science and industry were, he said, very close together, and he thought it was impossible for them to be too close together. Could one, indeed, tell where the one ended and the other began? It would be very difficult. Personally he would have worded the toast "Industry and Peace." Peace was the more urgent thing for them at this time, because without peace among themselves they could not use their industry, and they could not use their science. So industry and peace were now what they were all striving for, and both were absolutely essential to them.

Dr. W. R. Ormandy, in reply, remarked that there was no doubt that this country, since the war, had not maintained that regard for science which made itself so evident when the Government discovered that they could not do without the scientist and the engineer. During his own visits to the Continent he had seen some most astonishing things, one or two of which he would like to mention. It was really remarkable to see what was going on around them. The members might have heard that methyl-alcohol was used very largely in the manufacture of dyes and disinfectants. Well, this country was dependent upon the wood distillers of America for its supplies. But the Germans had discovered, after ten or twelve years' work, that, by passing water gas over a catalyst at a high temperature and high pressure, they could make methyl-alcohol, and of this they were at the present time producing some 6000 tons a year. This country was buying from America at £50 or more per ton what Germany was thus turning-out at a cost of about £12 a ton. But in this country did one think it was possible to get manufacturers to spend tens of thousands of pounds a year merely because their technical advisers had told them there were difficulties which could be overcome? In Germany, they had realized that science paid, and was an asset to a country.

Converting Coal into Oil.

They had also succeeded in Germany in converting coal into oil—not distilling the coal, but charging it into a retort under pressure and heating in the presence of hydrogen, so converting a large proportion of the coal into oil. This did not yet appear to be a commercial proposition; but they were dealing with half-a-ton an hour, and in his opinion the technical difficulties which still remained would be solved. When this happened, it would alter the whole economic position of the world. By means of coal, countries would come into their own again; and the British Empire, possessing coal deposits in practically every Colony, would be in a position which to-day it unfortunately did not occupy. There was no doubt about it that petrol and heavy oils were the fuels of the future. More than one European Government were taking a practical interest in the question; and the Fuel Research Board of this country were by no means behind their Continental neighbours in the attention they had given to this important development. In connection with various matters, marvellous progress was being made every day. "We in this country," concluded Dr. Ormandy, "have no reason to hide our heads. Where we have failed is that we have left it to Germany to develop our discoveries into commercial propositions. Science pays, and science is industry; they are one and indissoluble."

Col. Sir Arthur Holbrook, proposing "The Institution," recalled the fact that on a similar occasion a year ago the principal speaker had urged upon them all the great importance of research. The truth of what was then said had been amply borne out by Dr. Ormandy. There was no doubt in his own mind that, if the English people made up their minds to it, they could lead the whole world. They must wake up to the fact that engineering in this country had reached a position which called for very serious thought. Workmen must give a full output for the wages they received, and this could only be achieved by the establishment of peace in industry. Surely the time had arrived when they should all be settling-down to see what could be done to restore this country's position as a great commercial power. He agreed that those who were leaders had given insufficient attention to scientific research; and this must be changed. But the great aim of all of them for the time being should be to try to get a better understanding between masters and men—to endeavour to restore confidence. The growing class feeling must be broken-down. The Institution could do a great deal to bring about that good feeling which was so greatly to be desired.

Responding, the President pointed out how greatly the status of the engineer-in-charge had improved during the last quarter-of-a-century. At the present day greater economy and increased efficiency were absolutely essential; and the best results could only be obtained by the exercise of the skill of the engineer-in-charge.

"Our Guests and Friends" was submitted by Mr. W. R. Welton (the Chairman of the Technics Committee), and responded to by Mr. H. G. Burford, who urged the need for closer co-operation between the Institution and the senior organizations of the country. "The President" was toasted, and in reply Mr. Cooper acknowledged the zealous service rendered to the Institution by Captain Alfred E. Penn, the indefatigable Hon. Secretary.

Smoke Abatement.

At a sessional meeting of the Royal Sanitary Institute recently held at Leicester, Mr. F. G. M'Hugh, Chief Sanitary Inspector at Leicester, read a paper on "Smoke Abatement." In this he emphasizes that domestic smoke presents the greatest problem; and he goes on to say that there are three remedies—gas, electricity, and smokeless solid fuel. Electricity for heating can be dismissed, on account of expense. Gas also is expensive for the poorer classes. He mentions the interesting decision of the Hull Corporation to instal central heating in 600 concrete houses about to be built. In the Austin Motor Company's village at Northfield, near Birmingham, each house has its central heating system, which is coke fired. These dwellings are smokeless, popular with the tenants, economical in fuel, and well ventilated. Cooking is done by gas. It is the opinion of Mr. M'Hugh that the solution of the domestic smoke problem lies in low-temperature carbonization. In this connection he refers to the Nottingham scheme: "The manufacturers of Coalite have entered into a contract with the Nottingham Corporation, who have undertaken to purchase a minimum of 2 million c.ft. of gas per day for a long period. A further contract has been entered into with a colliery company for coal for 25 years. The plant, it is stated, will be capable of dealing with 1000 tons of coal per day. I am given to understand that this scheme is receiving Government support."

NEW GAS-WORKS AT PITWINES, POOLE.

[Extracts from a Supplement to the Presidential Address of Mr. P. G. G. Moon, F.C.S., to the Southern Association of Gas Engineers and Managers.]

The gas requirements of the Bournemouth Gas and Water Company's district have, in the past twenty years, practically doubled in each decade. The popularity of the 25 miles of coast land administered by the Company, and the continuous estate development that is taking place throughout its length, suggest that this tendency will persist for a considerable time to come. It became obvious a few years ago that, having regard to the congested state of the existing works of the Company at Poole, it would be necessary in the very near future to construct new works to meet the continually growing demand.

Two courses were open to the Company. One was to acquire land adjoining the existing works on Poole Quay; but as this would have involved the compulsory acquisition and demolition of some seventy cottages and a large pottery works, as well as leaving the extended works closely surrounded by houses, it was turned-down. The second was to obtain full parliamentary powers over the Pitwines site, situated some 500 yards inland from the Poole Quay Works, and on which the Company already had purifiers and a 2¾ million c.ft. gasholder. The chief disadvantages of the site were: First, that it was reclaimed harbour mudlands, with very poor subsoil for foundations; and, secondly, that there was no direct access to a deep-water berth on the harbour. After careful consideration, it was decided to extend on this site, and to overcome the lack of deep-water accommodation by connecting-up the existing coal unloading transporters at Poole to the new site by means of an overhead cable conveyor. The necessary powers were obtained in 1919, and designs for the new works were started in 1923.

GENERAL VIEW OF WORKS FROM THE AIR—OCTOBER, 1924.

Note the special reclamation for the Coal Store.

General Scope of the Works.

After a careful study of the whole position, it was decided to lay out the works to have an ultimate capacity of three sections of 4½ million c.ft. per day each, or 13½ million c.ft. per day in all. Having regard to the difficulty and risk of putting in foundations at a later date in such difficult ground alongside existing buildings, and having in mind the normal rate of increase at Bournemouth, it was decided to put in such buildings as the main block (housing the water gas plant, boilers, producers, exhausters, and electric generators), the coal store, and sulphate house of sufficient size to deal with the whole of the three sections.

It was estimated that the first section would provide adequate capacity for four to five years from 1925 onwards.

Foundations.

A large number of borings were made and carefully plotted. Below the reclaiming material, which consists of some 3 ft. 6 in. to 10 ft. of clinker, lies a layer of harbour mud of thickness varying from 1 ft. 6 in. to 8 ft. Under this there is a bed of clay of circumscribed area and varying thickness, all of it well below tide level. Beyond the confines of the clay there is nothing but a great depth of fine waterlogged sand. The whole area is full of tidal water; and the sand is at such a depth, and so fine, that the extensive pumping which would be necessary would be both costly and full of difficulty and danger. Altogether some 74 borings were made.

It was found that there was room on the thicker portion of the clay bed for the retort house and the relief holder, but that all the rest of the plant would have to depend either on reinforced rafts below the mud level or upon reinforced concrete piles. Careful estimates were made of the comparative costs of these two methods, with the result that it was found that, although expensive, the piling method was cheaper than the raft method, largely because of the considerable excavations that would be necessary in the latter case to get below the mud level, and the large amount of timbering and pumping that would be required.

Experiments were made with 14 in. square reinforced piles, and it was found that a good "set" could be obtained at an average depth of from 25 to 30 ft. The piling method was finally adopted, and the variations in the ground resistance as the work proceeded fully confirmed the wisdom of this decision. In many cases the piles would penetrate fully 8 ft. practically by their own weight. Some piles would reach their "final set" with the head of the pile 1 ft. below ground level, while piles of the same length (30 ft.) right alongside would finish 8 ft. out of the ground. The set specified was "that when using a 30 cwt. ram with a fall of 4 ft. 6 in., the piles should not have a set of more than half-an-inch after ten blows." The piles, after driving, were cut-off to the various required levels, capped, and braced or covered with reinforced concrete rafts, as circumstances required.

The carrying capacity of the 14 in. square piles has been taken throughout the job at 50 tons per pile, with a factor of safety of six. After some preliminary experiments, the Birmingham Concrete Steel Company, who were responsible for the reinforced concrete design throughout the works, submitted data which justified the adoption of 50 tons per pile as the safe carrying-load for the conditions obtaining at Pitwines.

Some interesting facts were noted during the pile driving:

(*a*) Owing to the mud layer and the superincumbent reclaiming material, considerable vibration was set-up during driving in a large area of the surrounding land. The vibration was so considerable that it was obvious there would be considerable risk if driving were done alongside existing buildings.

(*b*) The piles passed through the tough clay bed, where it was encountered, with comparatively small resistance, and only on reaching the fine sand below was real resistance found.

(*c*) Two piles driven alongside the retort house foundations, which were in the form of reinforced concrete slabs carried on the clay, and not on piles, lifted the nearest loaded retort house foundation 2 in., and cracked the re-

GENERAL VIEW OF WORKS — MARCH, 1925.

inforced beam of which the foundation was formed. The displacement effect of the piles must have acted on the clay as on a fluid, and pushed up a wave of clay, which gave an upward thrust of sufficient intensity to lift and crack the loaded foundation slab.

General Arrangement.

Broadly the works are set-out in relation to two base lines—one through the main block of buildings parallel to the railway, and the other at right angles thereto for the retort houses.

Cableway Conveyor.

The cableway conveyor is the connecting-link between the existing Poole Works at the quayside and the new works at Pitwines. It is designed for an ultimate capacity of 100 tons of coal per hour, although it will at first function at 50 tons per hour. It is of the double cable type—one cable being fixed and supporting the loaded buckets which run on it, and the other moving and acting as the hauling cable. The total power required when the cableway is called upon to take 100 tons per hour will be 15 H.P. One man only is required to operate it. He works at the loading end; the tipping being done automatically. The automatic self-tipping buckets take 12½ cwt. of coal each, and "shot-pouch" filling arrangements prevent over-filling, and so reduce the risk of dust.

The cableway takes coal, coke, and ashes from Poole to Pitwines, and can, if necessary, take coal from Pitwines and feed it into the retort house conveyors at Poole. Coal can be fed from the steamer, *via* the transporters and the cableway, direct

RETORT HOUSE, SHOWING SKIP HOIST GUIDES.

to the retort house or coal store at Pitwines. The cableway will pass over two public roads, which are protected by reinforced concrete bridges; and here the carrying cables are arranged one above the other.

The cableway conveyor, protection bridges, and loading stations were all constructed by the Mitchell Conveyor and Transporter Company.

Coal Store and Coal Handling Machinery.

The terminal station of the cableway is at one corner of the Pitwines coal store. Here automatic tripping devices are arranged to trip the cable buckets into any one of the three hoppers provided for coal, coke, or ashes respectively. The coke and ashes are picked-up from their hoppers as required by the telpher, which is designed to serve the terminal station at this point. The coal is fed from its hopper on to a reversible rubber belt conveyor 24 in. wide, which runs the whole length of the coal store. From the reversible belt, the coal is taken either direct to the retort house through an automatic Avery weighing machine or on to a travelling belt conveyor 18 in. wide, which can be traversed to any position in the coal store with its throw-off carriage set at any required spot. The throw-off carriage is 26 ft. above ground-level, and the coal store can be filled throughout, without man-handling, to an even height of 20 ft. The travelling conveyor is carried on a steel-framed traversing bridge supported by the two longitudinal walls of the coal store and by a central reinforced concrete gantry down the middle of the store.

The coal is reclaimed when necessary by a travelling level luffing electric crane with a grab of 30 cwt. capacity. The crane is carried on a girder bridge spanning from one wall to the central gantry. The crane jib is long enough to reach from its central position to either side of the coal store, and to deposit the coal either into a feed hopper for the reversible belt conveyor or, when it is desired to send coal from Pitwines to the Poole Works, into a reinforced concrete feed hopper for the cableway conveyor.

The coal store itself is constructed of reinforced concrete, 315 ft. long by 100 ft. wide, with the rail level for the crane and conveyor 20 ft. above ground. A dust and wind screen is carried to 7 ft. above the rails around three sides of the store in thin reinforced concrete. The total capacity of the store is 15,000 tons.

An attempt has been made by a very broad but comparatively inexpensive treatment, to relieve what must otherwise have been, having regard to the over-all dimensions, an unsightly box-like construction, and give it a more pleasing elevation. The effect has been obtained by oversailing 18 in. with the wind and dust screen walls, which are carried on precast corbel blocks, at the same time setting-out the walls at each corner and carrying the apparently massive buttresses so formed above the general level.

Retort House.

The retort house is planned with its main axis at right-angles to the coal store, and in such a position that it can receive coal from the reversible belt conveyor running parallel to the coal store through the Avery automatic weighing machine into an automatic electric skip hoist which will be described later. The retort house is of the Woodall-Duckham vertical type, and has six beds of four 7-ton retorts arranged in two benches. The retorts themselves, with their heating flues, are built-up of silica blocks so designed that the "breathing" due to expansion and contraction can be accommodated without distortion of the retorts or flues.

Two producers are arranged at the end of each bench; and the carbon monoxide flues, secondary air flues, and regenerators are disposed along the longitudinal walls of the retort bench so that they are available for inspection or repair with a minimum of inconvenience. The producers are of the hanging-bar grate type, and special attention is given to the distribution of cooling water for the bars and the sealing of the water plate against short circuiting. The ashes are continuously extracted into a cast-iron hopper of the same type as that used for the coke extraction on the retorts.

The waste gases are passed through a waste-heat boiler having a capacity of 4750 lbs. of water per hour from feed at 60° Fahr. to steam at 120 lbs. per sq. in.

The coke is received into telpher skips of the balanced-wheel type, of sufficient size to take the coke from four dischargers. The skips are then pushed out and lifted by a telpher, which takes them to the coke hoppers or any desired part of the works. The plant for filling the top coal and coke hoppers consists of automatic electric skip hoists and belt conveyors. With the skip in the bottom position, coal is allowed to run from the Avery automatic weigher; and as soon as the weight exceeds an arranged figure, the hoist starts upwards, and the supply of coal is automatically cut off. When it reaches the top, the skip automatically tips and descends. On reaching the bottom position, it opens the coal feed again, and the cycle of operations is repeated.

PILING FOR MAIN BLOCK BUILDING.
Note the difference in the final levels of the various piles.

The coal at the top, when discharged, is fed on to a fixed rubber belt which runs over the hoppers nearly to the middle of the house. From this belt, it falls on to a short reversible rubber belt, which is mounted on an independent framework carried on wheels, which can be traversed so that one or other of its ends is over any hopper (either coal or coke) in the house. It will be seen that by this arrangement coal or coke can be automatically put into any hopper from either the coal hoist at one end of the house or the coke hoist at the other.

The screened coke is fed from the outside concrete coke hoppers into the coke-hoisting skip by a reversible rubber belt conveyor operated electrically from the top of the retort house. The coke skip discharges at the top of the retort house on to a fixed belt conveyor similar to the one at the coal hoist end, and this in turn discharges on to the shuttle belt conveyor.

The skip hoist and belt conveyors were supplied by the Mitchell Conveyor Company, who have many similar installations working in large electricity generating stations.

The retort house is of steel framework, filled with Bridgwater brick panels; and the roof is covered with corrugated iron sheeting, protected by bitumastic covering, and coloured a dark

maroon. The house and bench are built on reinforced concrete rafts carried on a clay bed 13 ft. below ground-level; and, as the latter is 7 ft. O.D., it will be seen that the rafts are well below tide level. The full guaranteed capacity of the house is 2,730,000 c.ft. of gas per day of 480 B.Th.U. The pressure regulation is effected by means of "Arca" regulators.

The present retort house is built at one end of the coal store; and the lay-out of the coal store and works generally is designed to accommodate two or three more retort houses of either vertical or horizontal type, parallel to the first, all capable of being served by the existing coaling plant.

Coke Hoppers and Screening Plant.

The telpher serving the retort house is arranged to pass along the centre line of a set of reinforced concrete coke hoppers. The same telpher and an extension of the coke hoppers on the present line will serve the second retort house when it is erected. An attempt has been made in the design of the hoppers and screening plant to overcome some of the disadvantages of our present methods. The average rotary coke screen is normally fairly long, and has to serve the purpose not only of a screen, but also of a very inefficient conveyor, thus tending to increase the amount of breeze made. In the present design the coke hoppers have been divided into three carefully-proportioned longitudinal partitions; and on the two middle walls a very short rotary screen has been mounted, which can be traversed from end to end of the hoppers. The line of travel is coincident with the telpher centre line; and the hopper on the screen can take a full telpher skip. The screen is of 4 ft. 6 in. in diameter and 11 ft. long, of which only 8 ft. is perforated. It separates the breeze in the first portion and the broken coke in the remaining portion; and the large coke falls out at the end. The whole of the sections are enclosed to reduce dust, and shoots lead the screened products to their appropriate longitudinal hoppers. The breeze, having the steepest angle of repose, falls into the central narrow hopper. With this arrangement not only is the travel in the screen reduced to a minimum, but the falling coke can be largely arranged to fall upon existing coke slopes, and further breakage due to long drops can be avoided.

Condensers.

The condensers are of the Holmes type with horizontal cast-iron tubes arranged with water headers so that the water circulation follows a definite path throughout. They are of 3 million c.ft. capacity, and according to tests made with similar condensers at Poole are more efficient and reliable than any other type. The following figures give some idea of the performance of this type of condenser when dealing with 2½ million c.ft. of gas per day:

Water inlet	58°	Fahr.
Gas outlet	60°	,,
Water outlet	121°	,,
Gas inlet	140°	,,

They have the added advantage that the water tubes are accessible for cleaning purposes without shutting-off the gas stream.

Owing to the peculiar difficulties of the site, the foundations for the condensers for the future No. 2 retort house were put in at the same time as the general foundations for the first section.

Main Block Buildings.

The main block buildings are designed to house ultimately all the water gas plant, boilers, exhausters, and generating plant required for the completed works, as well as the fitting shops and messrooms. They are designed in reinforced concrete carried on reinforced concrete piles; and, as with the coal store, an attempt has been made, by a simple treatment, to give them a reasonably pleasing appearance. The three fuel-using plants—water gas, boilers, and producers—have been arranged adjacent to each other, and the hoppers serving them are on the line of the telpher.

The hoppers are of sufficient capacity to hold three days' fuel, so that no night or week-end work on the telpher is necessary in filling them. Instead of designing these hoppers as a separate structure supported on the roof of the building, they have been incorporated with the whole design, and have thus given a better opportunity for developing the general elevation.

Between the hoppers for the water gas and those for the boilers an ash shaft has been left, with a sunk well, so that a skip just below ground-level is always available to receive ashes from boilers, water gas plant, or producers. These are dealt with by the telpher, which also runs over the ash washing plant.

A deep parapet around the power house roof masks the four cast-iron tanks supplied by Messrs. Mather and Platt: Hard water, 47,000 gallons; soft water, 47,000 gallons; salt water, 27,000 gallons; and weak liquor (covered), 27,000 gallons. When full these tanks represent a load of 800 tons on the roof.

COAL STORE, WITH RETORT HOUSE AND TELPHER IN BACKGROUND.

In the top of the two towers flanking the telpher section are placed two cast-iron tanks of 17,500 gallons capacity each, also by Messrs. Mather and Platt, for high-level water and strong liquor respectively.

Carburetted Water Gas Plant.

The carburetted water gas plant consists of one set of 2 million c.ft. per day capacity by Messrs. Humphreys and Glasgow. The generator is of the self-clinkering type. It is unlined, and jacketted with a water boiler. The bottom of the generator shell ends in a water seal carried in a revolving cast-iron ash pan. The latter carries a conical grate which projects above the water seal and supports the fuel bed. This conical grate is set slightly eccentrically to the generator shell, so that any large clinkers which drop into the annular space between the grate and the shell are crushed as the ash pan revolves. A charger, hydraulically operated, feeds the coke from the hoppers overhead into the generator while the latter is at work. With the self-clinkering grate and the hydraulic charger 24 hours full operating per day is possible. That is to say, with a six-minute cycle, 240 runs in the 24 hours are possible. Automatic chargers are fitted to the four water gas sets in use at the Poole Works. They have been very successful, and have increased the output of the plant by 7 to 10 p.ct. The plant is fitted with a waste-heat boiler of the usual type and the latest design of dust extractor.

Boilers.

Two Stirling water-tube boilers of 10,000 lbs. per hour capacity each are installed, fitted with Babcock and Wilcox chain grate stokers mounted independently on rails, so that they can easily be withdrawn bodily for repairs. These stokers are interchangeable. Continuous carbon-dioxide recorders are connected to each boiler. It has been found that with similar boilers at Poole, also controlled by carbon-dioxide recorders, an evaporation is obtained of 6·8 lbs. of water from and at 212° Fahr. per lb. of coke breeze. The whole of the steam-using apparatus on the works is arranged to exhaust to vacuum, using two 1000 H.P. tubular condensers originally fitted in torpedo-destroyers and bought from a local ship-breaking yard for £250 each, complete with air pumps.

Producer Plant.

Alongside the boiler house are situated the 350 H.P. Dowson suction producers which supply the gas for the gas-engine dynamo plant in the adjoining power house. These are placed in this position not only so that they shall be near the engines and under the hoppers, but also that they may be served by the one stoker, who will be in charge of the boilers, water softening plant, feed pumps, condenser plant, and hopper storage.

Some criticism has been passed on the use of producer gas for power production on a gas-works. In reply to this, it may be pointed out that a "load" of the type found in a gas-works power house, persisting as it does throughout the whole 24 hours, eliminates most of the disadvantages usually, and rightly, associated with such plants working intermittently.

Water Softening Plant.

The water softening plant of the "Permutit" type, installed by United Water Softeners, Ltd., is situated in the producer house. It has a capacity of 48,000 gallons per 24 hours. A similar plant, but of larger capacity, has been in use at the Poole Works for some time past, and has proved itself to be very reliable. Some such plant is particularly desirable for waste-heat and water-tube boilers. Two precautions are necessary, however. One is to "blow down" the boiler at sufficiently frequent intervals; the other is to use Monel metal for the valve seatings and gauge fittings, as brass and gun-metal are attacked by the alkali in solution.

Power and Exhauster House.

The whole of the coal gas and water gas exhausters, electric generating plant, water gas fans, and compressors for the completed works will be housed eventually in the one building. The plant, when finally installed, will be looked after by one charge hand and one assistant per shift.

The exhausters will be of uniform size throughout—viz., 125,000 c.ft. per hour. Three, made by Messrs. G. Waller & Sons, are installed at present. They are situated on an elevated platform, with three lines of easily accessible mains on the inlet and outlet sides respectively. These are so arranged that the gas from any inlet main can be put through any exhauster and into any outlet main. This uniformity of arrangement and interchangeability of exhausters simplifies the problem of stand-by plant, and also reduces the number necessary.

The first two electric generating sets consist of two 150 KW. 230 volts D.C. British Thomson-Houston generators, direct coupled to two 250 H.P. twin cylinder horizontal gas engines. The whole installation of producers, gas engines, dynamo, compressors, and auxiliaries was supplied by the Keighley Gas Engine Company.

In the power house are also situated the two 75 H.P. steam turbine blast fans for the water gas plant. These also run to vacuum, and are connected to the water gas plant by a rectangular reinforced concrete duct of 3 ft. 6 in. by 2 ft. section, instead of the usual sheet-iron circular tubing.

Electricity Distribution.

The main switchboard is situated in the power house, and is fully equipped for the first installation, with provision, in the shape of spare panels, for the succeeding installations. The panels are of white marble, and are fitted with the necessary switchgear, meters, circuit breakers, &c. From experience at Poole with switchgear operating in gas-works atmosphere, it was decided to increase the size of the frictional copper segments to obtain increased life; the knife switches being made 100 p.ct., and the circuit breakers 200 p.ct., larger than normal practice.

In order to reduce the number of long cables to a minimum, the whole of the power for the retort house and coal and coke-handling plant is dealt with by a separate cable carried to an auxiliary switchboard, situated in the retort house. This board is of black slate and is totally enclosed in a dust-proof glass panelled housing.

REINFORCEMENT FOR RETORT HOUSE FOUNDATIONS.

Compressed Air Plant.

The air compressors are both of the Reavell rotary type, one steam and the other electrically driven. They are of 153 c.ft. of free air per minute capacity, and compress to 100 lbs. per sq. in.

Gantry Cranes.

Travelling gantry cranes span both the exhauster bay and the main bay, and a horizontal gap of adequate size has been left in the wall dividing the power house from the fitting shop, so that the crane can pass right through into the fitting shop, taking with it any machinery requiring attention—which can in this way be taken direct to the appropriate lathe or machine which is to deal with it.

At the end of the main block, adjoining the power house, are situated the workshops, and above them the messrooms, bathrooms, lavatories, and cloakroom.

Telpher.

The telpher is designed to connect the retort house, coke hoppers, main block buildings, ash washing plant, and cableway terminal hoppers. It makes a complete circuit in passing these various points, and for the first and second sections of the works will operate without a rail switch of any kind—a decided advantage in a telpher.

Relief Holder.

The relief holder, constructed by Messrs. Clayton, Son, & Co., is of 400,000 c.ft. capacity. The steel tank is carried

on a concrete raft on the clay 13 ft. below ground-level. It is placed where it can be readily seen from the water gas house, and is designed with two lifts, spirally guided, and with a special guard plate running round the curb of the outer lift to prevent oil tar picked-up by the inner lift from overflowing and running down the outside of the outer lift.

Ammonia Extraction Plant.

The ammonia extraction plant consists of a Livesey washer, rotary ammonia washer, and a special lead-lined acid washer. No water is used on this plant. The weak liquor from the retort house is used in the rotary washer, and the ammonia left in the gas is absorbed in the acid washer, the contents of which are kept at about 4 p.ct. acidity. This system has been in use at Poole for many years, and considerably reduces the volume of liquor made. The concentrated acid solution of sulphate of ammonia is used up in the saturator. The whole of this plant was supplied and erected by Messrs. W. C. Holmes & Co.

Tar and Liquor Storage.

The tar and liquor from the retort house are received in two small boiler tanks of about 2000 gallons capacity each, placed below ground-level. These tanks are arranged so as to promote the separation of tar and liquor; these latter being pumped separately to overhead storage tanks. These main storage tanks are of mild steel, covered, and of 200,000 gallons capacity each, standing on a reinforced concrete raft carried on piles. The evaporation of ammonia from the liquor storage is prevented by a 3-in. layer of gas oil. The liquor inlet, which enters at the top, is carried to the bottom under the oil level, and is fitted with an open pipe at the top as a syphon break.

In addition to the two tanks for tar and liquor, there is a third tank of a similar size and construction for gas oil. These three tanks were originally carried on a reinforced raft placed direct on the ground, which at this point had been reclaimed for many years. When the first tank was under test, and only one-third full, it was found that the raft had settled at one end some 4 in., and serious cracks had developed in the raft itself. As this represented the effect of some 600 tons only out of a full load for the three tanks of over 3000 tons, it was obvious that it would be necessary to transfer the tanks to new foundations supported on the requisite number of reinforced concrete piles, and this was eventually done. This experiment was unfortunate in some respects; but it at least served to justify the policy which had been generally adopted with regard to the foundations of the rest of the works.

Tar Treatment Plant.

Near the tar and liquor storage tanks is placed the plant for dealing with the tar required for road tarring, &c. A 3000 gallons per day Wilton dehydrating plant has been removed from the Poole Works and re-erected on the new site. Alongside has been erected a new cascade type of plant of 10,000 gallons per day capacity, supplied by Messrs. Clayton & Co. Mixing tanks for preparing a special mixture of tar and bitumen for road surfacing have also been provided; and the storage and delivery tanks for the prepared tar and the tar and bitumen mixture are arranged in line with the general tar plant. These delivery tanks are erected sufficiently high above ground-level to allow of the barrels being filled on a loading platform at the level of the motor lorries which transport the tar. In close proximity to these plants a small tar macadam plant has been erected. This has made the tar macadam used in the works paths and secondary roads, and is now available for making macadam for footpaths for the various local authorities.

Ash Washing Plant.

The ash washing plant, which is constructed in duplicate, is situated on the line of the telpher, and deals with the ashes from both the Poole Works and the Pitwines Works. An inclined rotary cylinder separates the clinker from the coke by means of an internal angle-iron spiral and a descending stream of water. The coke is, by reason of its lower specific gravity, washed to the bottom end of the cylinder, and the clinker is carried to the top of the spiral angle-iron. The water used is circulated continuously by a centrifugal pump, and the fine dust is collected as sludge by sedimentation in settling tanks. This system has proved very effective for many years past in the Poole Works in a plant costing approximately £750. The cost of coke recovery over 22 months (excluding interest on capital) was 3s. 9d. per ton of recovered coke.

Purifiers.

No provision has been made for the construction of additional purifiers for the first section. This is due to the fact that the existing purifiers have a reserve capacity which will serve adequately for the requirements of the Company for the next two years.

Sulphate of Ammonia Plant.

The designs for the sulphate plant and house have been completed, and the contract placed, but no work upon them has been commenced at the time of writing. The whole of the liquor from both works will be treated by this installation, and provision has been made in the general lay-out for three sections, one only of which will be put in at first. The output of this section will be 6 tons of dry neutral salt per day, when working with 8-oz. liquor. Except for two special features the plant, which will be erected by the Chemical Engineering Company, substantially follows present-day standard practice. One of the special features is the placing of the liming or soda ash plant (whichever is in use) at the top of the building, so that the alkali enters the lime still by gravity, thus doing away with the lime pump. The second novel feature is the arrangement for collecting the hot sulphate from the saturator and storing it in a steam-jacketted vessel in readiness for the centrifugal—an arrangement based largely on patents taken out by Dr. Lessing. A microscopical examination of the salt as it came from the saturator and as it left the centrifugal in ordinary practice showed a large increase in the number of very fine crystals, due undoubtedly to the lowering of the temperature of the magma on the draining board. This not only promoted the deposition of fine crystals in the super-saturated solution, but also retarded the subsequent drying operations. To overcome these objections, a steam-jacketted Monel-metal vessel has been designed to hold enough sulphate for one centrifugal charge; and the magma from the saturator is discharged into it. An overflow from the vessel allows the mother liquor to run back to the saturator by gravity. The crystals of sulphate fall through the overlying mother liquor in the receiver, and a certain amount of suspended impurities and colouring matter is thereby washed out. A bottom discharge valve allows the charge of sulphate to run into the centrifugal by gravity. By this arrangement it is anticipated that a hotter charge containing fewer small crystals, and of an improved colour, will be obtained.

Railway Sidings.

The Pitwines Works are situated alongside the main line of the Southern Railway; but until the present works were projected, no sidings were installed. The first stage in the new works was the construction of sidings complete with railway weighbridge, and the provision of a petrol shunting locomotive and a 5-ton curved jib crane. Altogether some 2000 yards of standard gauge sidings have been laid; and coke, tar, acid, oil, oxide, fire goods, and general stores can now be handled direct from truck to their respective stores, or *vice versâ*.

Standardized Plant.

The gas valves throughout the works are Holmes' double-faced "Western" type, turning clockwise to open. The electric generators and all the motors are made by the British Thomson-Houston Company, and all the pumps used are of the Weir type.

Mains.

As the whole of the works stand on ground reclaimed by means of ashes, which would have a serious corrosive effect upon the mains, it has been necessary to protect them very carefully. This has been done by coating them throughout their length with a 6 in. envelope of pugged clay, recovered for the purpose from the relief holder foundations, and mixing with the trench-filling a liberal supply of precipitated chalk from the softening plant of the Company's water-works.

The whole of the reinforced concrete construction (with the exception of that required for the cableway stations and bridges, which were put in by the Mitchell Conveyor Company) together with the making and driving of the piles for the foundations, has been undertaken by Messrs. Thos. Vale & Sons, of Stourport.

In conclusion, I must put on record my indebtedness to Mr. Roy Irving, the Assistant Engineer, who has helped me in the design and erection of the new works. His capacity and zeal have been a very real help, and he has displayed all the keenness that one would expect to find in the son of one of our most respected colleagues.

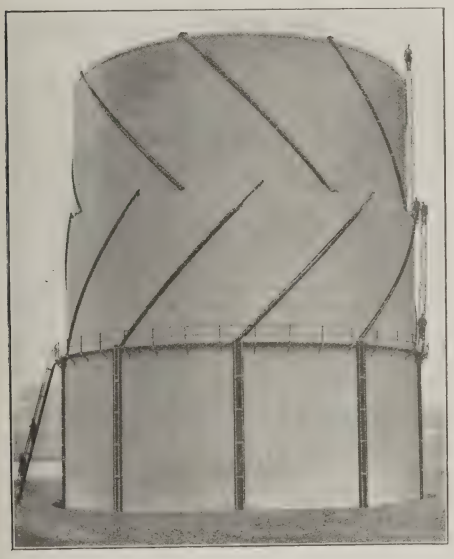
I must also pay a tribute to my Directors for the broad, sympathetic, and understanding spirit in which they have received and considered all the recommendations made to them. I realize that I am fortunate in having as Directors men used to handling big problems—men of outstanding eminence in their own respective spheres, and therefore well qualified to take the broad view and to inspire rather than to hamper their executive officials.

English Gas Men Spend.—This is the title given to the following editorial paragraph, which appears in the issue for March 21 of our American contemporary the "Gas Age-Record:" Miracles come to pass in England. Last year the British gas companies gave £75,000 to provide the marvellous exhibition of gas service and gas appliances that was shown at the British Empire Exposition at Wembley. American visitors were unanimous in their praise of this exhibit, and all concurred in the opinion that it was the best exhibit of the thousands there. We wonder what would happen if American gas men were asked to invest such a sum, equivalent to about $350,000 at the rate of exchange reigning last year, in an enterprise where they could not see the dollars flowing back to repay them for those they had spent. It is a thought to conjure with. And yet we believe that we are the foremost nation in the world when it comes to advertising.

NEW GASHOLDER AT HONLEY.

A large company of representative public men of the Holme and the Colne Valleys assembled at the Honley Urban District Council Gas-Works last Thursday, to participate in the inauguration of the new holder, which is described below. The gas was officially turned on by Mr. G. T. Oldham, J.P. (the Chairman of the Council).

Opening the proceedings, Mr. J. W. Broadhead said they were assembled to celebrate the official opening of Honley's new holder. Apart from the fact that he had the honour of representing there that morning the firm of Messrs. Robert Dempster & Sons, he might say the holder had not been installed before it was wanted. This would readily be understood when he stated that, with a maximum output during the 24 hours of 190,000 c.ft. of gas, there had been available storage of only 42,000 c.ft. How Mr. Harry Marsden (the Gas Engineer) had managed to keep the supply going was, he might say, without flattery, a miracle. Even with the new holder, Honley had only what was considered safe and proper storage for the economical carrying-on of the undertaking. Mr. Marsden would now, without the past anxieties, be able to give the consumers all the gas they required, and at a suitable pressure and of a much more uniform quality than he had been able to do in the past. The new tank held about 4000 tons of water; and it had not a single leak when filled. In connection with the contract, one of Messrs. Bryan Donkin's boosters had been installed. He had pleasure in asking Mr. Oldham, who had taken a great interest in the undertaking, officially to turn on the gas from the holder to the town; and he expressed the hope that the new structure would fulfil all that was anticipated from it, and always give great satisfaction.



The Two-Lift Spiral-Guided Holder at Honley.

The gas was then turned on by Mr. Oldham, who said he had the pleasure of seeing the first rivet put into the tank, and had put one in himself. Everything had gone on most satisfactorily, and now they had a fine holder, which was a credit to Messrs. Robert Dempster & Sons.

Mr. Broadhead asked Mr. Oldham to accept, as a memento of the occasion, a solid silver tea and coffee pot, suitably inscribed. Accepting the gift, Mr. Oldham declared that any souvenir was uncalled for; but nevertheless he should treasure the present, which would serve him well, as would the new holder the town of Honley.

After the ceremony, the company lunched together, when several toasts were honoured. "The Honley Urban District Council Gas Undertaking" was proposed by Mr. F. Littlewood, and responded to by Mr. Oldham. That of "The Contractors" was submitted by Councillor G. Borwell, and acknowledged by Mr. Broadhead. The toast of "The Visitors" was submitted by Councillor J. E. Heap (the Vice-Chairman of the Honley Council), and replied to by Mr. F. H. Robinson, of Harrogate (the President of the Manchester District Institution of Engineers). "The Engineers" was submitted by Mr. A. Whiteley, of Kirkburton—Mr. Marsden responding.

The Holder Described.

The new gasholder is of the spiral-guided type, with two lifts, in a steel tank. It has been constructed by Messrs. Robert Dempster & Sons, Ltd., of Elland, and is fitted with their "Elland" patent ball-carriages, and also their patent ladders. The holder, when fully inflated, stands 85 ft. above the ground—the outer lift being 75 ft. 6 in. in diameter by 30 ft. deep, and the steel tank 77 ft. in diameter by 30 ft. 6 in. deep—and has a capacity of 250,000 c.ft. In order to meet existing local conditions, the inner life throws a pressure of 8 in.

This holder is a further example of Messrs. Robert Dempster & Sons' improved system, which is now becoming well known, of guiding spiral holders by means of balls in place of rollers; and though this principle of guiding spiral holders was only placed on the market by them about two years ago, eight holders have already been completed, the first of which has now been working nearly eighteen months. It so happens that most of these eight holders are placed in very exposed positions, and during the past winter have been called upon to withstand gales of hurricane force. They have earned great praise from engineers who have had the opportunity of observing their very steady working under these trying conditions.

At the risk of repeating our former observations on this type of holder, we feel that a short description of the system would not be out of place. The essential differences in Messrs. Robert Dempster & Sons' improved method of construction of spiral holders lies in the carriages and the rails. Instead of, as in the ordinary system, the spiral rail passing through one or two pairs of flanged rollers, the rail (which has a circular groove on either side) passes between two pairs of case-hardened steel balls 2 in. in diameter. The rail is also provided with a second and smaller groove between the rail flange and the ball-groove, which serves to carry rain-water, &c., into the tank or cup without its having to pass promiscuously over the sheets.

Although this at first sight appears to be putting a gasholder on ball-bearings, this is not essentially true in the accepted sense of a ball-race. In an ordinary ball-bearing, the balls are free to revolve and travel in the direction of the wheel or shaft upon which it is mounted, whereas in the ball-carriage the ball is confined to a cup which prevents the ball travelling in the direction of the rail.

This point, which at first appears to be detrimental to the system, has been turned by the makers to their advantage. The diameters of the cup in which the ball rests, the ball, and the groove in the rail are arranged so that the ball is never in contact at two points diametrically opposite. The result of this is that the ball is continually spinning on an axis at right angles to the rail-face; and this axis, continually changing, prevents undue wear of any parts of the surface of the ball.

The ball-carriages themselves are made of forged steel of extremely heavy sections, and have a very large factor of safety against any stresses which the holder may be called upon to withstand. Another point of note in these ball-carriages is that all sliding parts are eliminated; the expansion and contraction of the holder being allowed for in the movement of the balls. The carriage is also fitted with a double swivel, which causes the balls automatically to set themselves parallel with the rail under any conditions, thus giving an equal bearing.

The rails themselves weigh nearly twice as much as the standard section rails used for spiral-guided holders, and are considerably stronger—special rolls having been mounted for producing them.

The Late Mr. H. E. Jones.—In connection with the funeral of Mr. H. E. Jones, brief reference was made in last week's "Journal" to the memorial service held at the Savoy Chapel, and the names of some of those present were mentioned. It should be added that the Society of British Gas Industries were represented by Mr. Samuel Cutler (Hon. Secretary), Mr. F. G. Cockey, Mr. Arthur L. Griffith (Secretary), and a representative of Messrs. Gibbons.

Treatment of Water Gas Tar.—Mr. J. D. Smith (Engineer and Manager of the Belfast Gas-Works), in a report to his Committee, says: "For a great many years—in fact, since the introduction of the carburetted water gas plant, I believe—serious trouble has been experienced with water gas tar. Very frequently this tar, immediately after leaving the plant, formed into an emulsion; and as it was useless to contractors in this form, we had to devise means for storing it until the tar and water separated. Many attempts were made to get over the difficulty, but all failed. I have had brought to my notice recently a water gas tar dehydrator manufactured by Super-Centrifugal Engineers, Ltd., of London; and the results of tests made by this plant on our tar have been eminently satisfactory. I am satisfied that the plant is efficient, and as the price is only £250 I recommend the purchase of one of these machines." The recommendation was adopted.

SCOTTISH JUNIOR GAS ASSOCIATION.
(WESTERN DISTRICT.)

The ordinary monthly meeting of the Western Juniors was held on March 28 at the Royal Technical College, Glasgow, when Mr. John M'Isaac presided over a good attendance.

The Hon. Secretary intimated that the annual general meeting would be held on Saturday, April 18.

SELECTING AND TESTING WROUGHT-IRON TUBES.

By John M'Intyre, of Glasgow.

All works should see that their tubes receive some test. A neat, reliable, and inexpensive plant can easily be rigged up at the end of the boiler house. Such a plant was in use in Glasgow up to about three years ago, and rendered excellent service. It consisted of a steam connection from a boiler, provided with a screw-down stop valve (as there is no reducing valve, this one serves the dual purpose of a stop and reducing valve), a pressure gauge to read a little above the test pressure, a tee connection with relief cock, a set of reducing couplings to accommodate various sizes of tube, and also a pair of suitable wooden trestles and V blocks with clamp, to hold the tube in a convenient position for working.

Method of Testing.

Take the length of tube to be tested, look over the outer surface, see if it is free from blemish, note the screws at both ends, try-on the coupling, then hold up to the light, look through inside, and see if there are any blisters or scale or anything abnormal. Next screw on to the coupling at the pressure gauge, and fix the coupling with a relief cock. Open the latter, so as to exhaust the air in the tube when the steam is turned on gently. When the air is removed, allow the steam to blow for a few seconds. This acts as a good scourer, and helps to cleanse the inner surface of the tube. Check the steam, close the relief cock, allow the pressure in the tube to rise to the agreed figure—(say) 25 lbs. per sq. in.—then shut-off the steam. Allow pressure to remain on for a little; and any defects will soon begin to show. The outer surface may be tapped lightly with a small hand hammer while the pressure is on, as this may assist in revealing any defect hidden by rust, scale, &c.

Some people dislike steam testing plants for wrought-iron tube, alleging that the steam leaves them wet, and they thereby become rusty. This is not the case.

Tubes at the street mains section were tested by a plant like this until the removal of the Dalmarnock Gas-Works workshops to their new premises about three years ago. Then, with no steam boiler at hand, we had to look around for some other method of testing.

An old ⊐-shaped hydraulic main was set up, and fitted with a fixed rod at the back and two swivel arms, between which a 12 ft. length of tube could be placed. The arms were swung into the box, which was filled with water. Air pressure was applied to the tube, and any defect was made visible by the air escaping causing small bubbles in the water. The tube, if satisfactory, was then removed from the trough and placed in the rack. This worked well, except for the fact that it was laborious to raise the air pressure by hand. However, the results were satisfactory enough to justify the department spending some money on a plant of the same type, but with a power-driven supply of air pressure. This was done, and the plant at present in use at the street mains section, Dalmarnock, was laid down.

The plant consists of a rectangular testing bath of mild steel plate, capable of testing tube up to about 12 ft. long, a large cylindrical receiver in which air can be stored at 30 lbs. per sq. in. pressure, a small air pump belt-driven from a wall shaft, the shaft in turn being driven by a 1½ h.p. Gardner gas engine. The pump belt striker is actuated by a cut-off device made by Messrs. Aerograph, Ltd., of London, which, when the predetermined pressure of 30 lbs. is attained at the receiver, stops the pump, and starts it up again immediately the pressure falls below this figure. When this new plant was put in operation, other items were introduced so that every aspect of the question could be taken into account, and nothing left to chance. These were a measuring rod to check lengths of consignment required of a specified length, a weighing machine to check the weight per foot run, a gauge bar to check the outside diameter, rods to ensure the correct inside diameter, and a plate gauge to test the thickness of the metal. To see how screws fit, a set of average couplings are used as gauges.

Table of Standard Sizes for the Range of Tubes in Common Use in Glasgow.

Nominal Bore. Inches.	Approx. External Diameter.	Screw. Whitworth Gas. Threads. per Inch.	Gas Quality. Thickness. W.G.	Gas Quality. Weight. Ft.-Lbs. Oz.	Steam Quality. Thickness. W.G.	Steam Quality. Weight. Ft.-Lbs. Oz.
⅛	⅜	19	14	0 6½	12	0 7¾
¼	½	19	13	0 9	11	0 11
⅜	⅝	14	12	0 13	10	0 15¾
½	1 7/16	14	11	1 2¾	9	1 6¾
1	1 7/16	11	10	1 9¾	8	2 0¼
1¼	1 11/16	11	9	2 5¼	7	3 0
1½	1¾	11	8	2 14¾	6	3 7¼
2	2⅜	11	8	2 12¾	6	4 14¾
3	3½	11	7	6 5½	5	8 2¾
4	4½	11	7	8 3¾	5	11 8½
6	6½	11	7	13 6	5	17 4

Discussion.

The Chairman mentioned that many people thought all testing was done by the manufacturers, and emphasized the importance of giving the matter serious consideration. The approximate cost of the new machine described by Mr. M'Intyre was £140. Would Mr. M'Intyre give the meeting some data regarding the running costs, number of pipes tested per hour, and the possible output of the machine?

Mr. Simpson (Greenock) was of opinion that all pipes should be tested in a simple manner at the gas-works, before being sent out for fitting. The small expense incurred in setting-up a plant for this purpose would be more than met in the assurance of general safety.

Mr. M'Intyre explained that with the old type of steam testing they were able to handle 10 to 12 pipes per hour; but with the new plant, the output was more than doubled. The cost of testing the pipes was approximately 0·28d. per ft. The output from this machine was estimated at 300,000 ft. per annum. The percentage of condemned pipes would be about 1 p.ct., while he had known of three-quarters of a delivery being condemned for scale and blister, due to bad quality of iron.

THERMAL BALANCE-SHEETS.

By R. F. W. Blakey, of Stirling.

Theoretical Considerations.

The first real investigations of the heat losses in the destructive distillation of coal to form gas, tar, and coke were carried out by Mahler, and later by Euchêne. A survey of their results shows that the decomposition of coal in a gas retort is an endothermic reaction. The loss of heat is calculated as from 2 to 6 p.ct. of the original thermal energy of the coal. It varies with the different types of coals, being greatest with coals of a high oxygen content—a fact which indicates that the oxygen-bearing compounds are responsible for the endothermic character of the coal. Lewes states that the loss of original heat on destructive distillation of coal is about 480 B.Th.U. per lb.

The approximate distribution of the thermal energy in the products of distillation of coal at high and low temperatures is as follows:

1 Ton of Coal = 300 Therms.

	High Temperature.		Low Temperature.	
Gas	72		35	
Tar	17		26	
Volatile matter in coke	3	199	29	223
Coke	196		194	
Loss	12		16	
Total	300		300	

These figures do not take into account the heat supplied externally to effect carbonization.

The loss of heat appears to be greater if the carbonization is carried out at a low temperature; and the reasons given for this are that the loss is augmented by the exothermic reactions predominating during the first period of the distillation, when the rate of evolution of therms is greatest, and that some of this heat is lost as sensible heat, whereas during the process of complete carbonization some of the sensible heat is converted into potential heat.

The gas industry is concerned with the gaseous thermal yield; and the greatest economy must be attained by a method which is not wasteful in volatile therms. The term volatile therm is taken to apply to the total therms in both gas and tar; and to a certain extent these are interchangeable. Partially to convert therms in low-temperature tar into gaseous therms, leaving as residue high-temperature tar, is a reaction which is recognized to take place in every high-temperature carbonization process. This is not to be compared with the interchanging of high-temperature tar therms for gaseous therms. In this instance, cracking of tar to gas is doubtful economy—first owing to pitch troubles; secondly, the yield of therms in the gas which results from this cracking is small. The tar is so altered as to be of little value to the tar distiller.

In horizontal retorts working under the best conditions, with good coal, and at a combustion chamber temperature of 1300° C., it is possible to obtain a high yield of therms in the gas, and also to retain a just proportion in the tar. The gas from this method of working is low in inerts; and consequently the density is lower than that necessary for efficient use for lighting purposes. The calorific value is also higher than is necessary. Carbonization at a still higher temperature would result in a reduction in the calorific value, and would also raise the density of the gas by dilution with the poor gas obtained by cracking the tar; but this method is not to be recommended, since there is a greater loss of the original thermal energy. The yield of therms in the gas may approach a higher figure than by the process of carbonization at moderate high temperature, but only at the expense of the tar. To convert tar into gaseous therms may appear to be good practice; but when

fully considered, it is seen that the game is not worth the candle. There are several remedies at hand to reduce the calorific value of the gas—namely, dilution with water gas, producer gas, or waste gases. By any of these methods good yields of gaseous therms may be obtained, without undue degradation of gas or tar.

Practical Results.

It may be of interest to consider some of the results obtained in Stirling with horizontal retorts and a Humphreys and Glasgow blue water gas plant. The carbonizing plant consists of mechanically-operated horizontal retorts, 20 ft. long and 22 in. by 16 in. cross-section.

Each oven is heated by an internal producer on the discharge side. The ascension pipes are on the discharge side. The plant was erected in 1907-8, and extended in 1910, and is specially adapted for use with the types of coal mined in the district. The average weight of charge per retort is about 8 cwt. The retorts are silica segmental.

The blue water gas plant has a capacity of 400,000 c.ft. per day, and is fitted with exhauster, station meter, and relief holder. It is an independent unit, all the gas being metered; thus control of the proportions of water gas added to the foul gas can be carried out satisfactorily. The coal used in the retorts is a mixture of Bannockburn, Plean, and Lanarkshire in the approximate proportions of 56, 17, and 27 p.ct. respectively, with the following average analysis:

	P.Ct.
Moisture	3·50
Volatile matter	35·08
Fixed carbon	57·50
Ash	3·92

Calorific value of coal as received = 13,803 B.Th.U. per lb.

The foul gas has an average analysis as follows:

	P.Ct. by Vol.
Hydrogen	53·0
Methane	30·8
Heavy hydrocarbons	3·4
Carbon monoxide	6·2
Carbon dioxide	1·3
Oxygen	0·4
Nitrogen	4·9

Average calorific value of gas = 591·4 B.Th.U. per c.ft.

The results taken over a period on the carbonization plant on the basis of 1 ton of coal retorted are as follows:

Volume of gas (corrected 30 in. and 60° Fahr.)	10,500 c ft.
Yield of tar	98 lbs.
Yield of coke	1434 lbs.
Coke used for producers	344 lbs.
Coke used for producers per 100 lbs. coal	15·3 lbs.
Temperature of combustion chambers	1270° to 1300° C.
Temperature of coke as pushed	950° C.

Approximate Thermal Balance.

Therms in 1 ton of coal		309·16
,, in gas	62·10	
,, in tar	15·65	
,, in coke	03·53	
,, in coke for producer		48·84
Therms not recovered—		
Loss from original therms in coal	27·88	
Coke used in producers	48·84	
	358·00	358·00

No allowance is here made for heat recovered in retort carbon.

The water gas is added to the foul gas after cooling to approximately atmospheric temperature.

Average calorific value of water gas	310 B.Th.U. per c.ft.
Water gas in mixed gas	39·9 p.ct.
Calorific value of mixed gas	481 B.Th.U. per c.ft.

Analysis of Mixed Gas.

	P.Ct. by Vol.
Hydrogen	52·4
Methane	19·2
Heavy hydrocarbons	2·1
Carbon monoxide	19·2
Carbon dioxide	2·3
Oxygen	0·4
Nitrogen	4·4
Gaseous therms per ton of coal	84·03
Gaseous therms obtained from coke (per water gas)	21·93

The efficiency of the water-gas plant is taken at approximately 58 p.ct.

The yield of therms per ton of coal retorted has been augmented to the extent of 21·93, at the expense of the thermal energy of some of the coke, and a suitable mixed gas has been obtained. Loss of volatile therms has been avoided by reducing the cracking process at high temperatures to a minimum; and any volatile matter remaining in the coke is partially taken advantage of in water gas manufacture. The conversion of therms in coke into gaseous therms is a process of about 55 to 60 p.ct. efficiency, and could be even higher if waste-heat boilers were employed; while the cracking of tar is only reckoned as 25 p.ct. efficiency at best, and then it is also attended with grave troubles in the retort house.

Thermal Efficiency of Water Gas Production.

Gas made per ton (gross) coke	61,035 c.ft. (corrected)
Gas made per run	2,100 ,, ,,
Coke to generator per 1000 c.ft. of gas made	36·7 lbs.
Dry coke to generator per 1000 c.ft. of gas made	33·03 ,,
Steam to generator per 1000 c.ft. of gas made	38·0 ,,
Dry coke to generator per ton of coal retorted	226·8 ,,
Equivalent in coke for steam raising for generator per ton of coal retorted	27·8 ,,
On basis of 1000 c.ft. water gas made.	
Input of Thermal Energy—	
Therms in coke	4·6879
Therms in steam (70 p.ct. boiler efficiency)	0·5754
Total	5·2633
Output of Thermal Energy—	
Therms in 1000 c.ft. gas	3·1000
Thermal efficiency of plant (excluding steam to drive turbine blower)	58·9 p.ct.

The determination of the thermal efficiency of the water gas plant gives a fairly reliable means of checking the working of the plant as a unit, and it is useful to note the drop in this efficiency as the plant continues in daily use. The steam to the turbine, being of constant value, does not affect the comparative figure given for the plant efficiency.

Dilution of Coal Gas with Air.

Dilution with air is in the above instance not necessary except in such small proportions as are needed for purification purposes; and then it is added at a point where the gas has attained atmospheric temperature. The addition of air in the retort house should certainly be avoided, if the maximum thermal yield is to be obtained. Air admitted at retort doors is particularly wasteful, since it not only dilutes the gas, but causes tar to be subjected to a process of cracking in the ascension pipes. The latter are virtually converted into small tar distilleries, with partial combustion of the products taking place at the same time.

It is not always realized that the conditions of carbonization can be modified to give the required distribution of therms; and it is not a difficult matter to determine the conditions likely to be most remunerative and suitable with existing plant. It would appear that the practice to be adopted is to use charges sufficiently heavy to avoid free space in the retorts, thus preventing the degradation of gas at high temperature, and to carry out the carbonization as rapidly as possible, without making use of excessively high temperature.

The thermal balance-sheet is as important to the successful gas undertaking as the financial balance-sheet, since therms have to be bought, and afterwards sold in a more convenient form. It is a great pity that coal is not purchased on a thermal basis. It has been suggested that the smaller gas undertakings in each district should have a fully equipped technical laboratory available for their joint use. The first duty of this scheme would be to assure the delivery of the therms—and in the proper form, for two coals of the same calorific value are not necessarily of the same gas-making value. The day is not far distant when the smallest of us will demand satisfactory proof that every truck load of raw therms delivered is graded.

I would like to acknowledge the help afforded by Mr. Smith, of Stirling, in allowing me to use all data required for this paper.

Discussion.

Mr. Simpson (Greenock), while appreciating the manner in which Mr. Blakey had dealt with his subject, said he was inclined to differ very much from him. Mr. Blakey had treated his subject entirely from the point of view of coal conservation, while he was of opinion that they in the gas industry should give their first consideration to the financial aspect of the case. The financial balance-sheet was infinitely more important than the thermal balance-sheet; and their first duty should be to sell cheap gas. Efficiency would follow in the natural course of events. With regard to Mr. Blakey's remarks relating to dilution with waste gas and producer gas, he hoped this would not be taken up. He instanced the serious effect this would have on the mains.

Mr. Blakey, in reply, said that he had studied his paper purely from the technical point of view, and thought that gas made from tar instead of coke was not good business. In his opinion, tar was too valuable to break up for the manufacture of gas. With regard to dilution by waste and producer gases, he still thought that this could be carried out in small works where there was no water gas plant.

Books Received.—From Sir Isaac Pitman & Sons, Ltd., we have received the following books: "Low-Temperature Distillation," by Sidney H. North and J. B. Garbe (price 15s. net); "The Carburettor Handbook," by Ernest W. Knott (price 10s. 6d.); and "The Metal Worker's Practical Calculator," by J. Matheson (price 2s. net). The Society of Chemical Industry have forwarded a copy of Volume IX. of their "Annual Reports of the Progress of Applied Chemistry." The price of this is 7s. 6d. to members of the Society, and 12s. 6d. to non-members, post-free.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Visit to Woolwich Arsenal.

On Thursday afternoon, April 2, nearly a hundred members of the Association visited the Royal Arsenal, when, under the guidance of their President, Mr. W. Newton Booth, B.Sc., who was ably assisted by Messrs. Manchee, Good, Sheryer, and Ferris, they inspected the principal shops of the Royal Ordnance Factories. A visit to the Arsenal—as Mr. Booth remarked—must always prove of great interest to the Britisher; and when the visitor happens to be an engineer, this interest is doubly strong. The afternoon was thoroughly enjoyed; and all members of the Association must have realized the full meaning of the term "British engineering," when they were brought into contact with the extreme accuracy and superb skill without which the production of the mighty guns would be impossible. Perhaps the thought crept in that all this skill could be used for less irrational purposes; but as the party were representative of a gas, and not an ethical, society, this thought need not be pursued further.

An "Industrial Town."

The Arsenal is an enormous place; its area being about four square miles. To visualize it mentally, one has to adopt the "Beckton" outlook. On first visiting Beckton, one is told that there are about sixty miles of railway track; and on entering the Arsenal, which can well be termed an "industrial town," one learns that the length of track must be reckoned not in tens, but in hundreds, of miles. It will be remembered—certainly by those who endeavoured to fight their way to the 'buses in Beresford Square—that during the war there were employed at the Arsenal no fewer than 120,000 men—a number now reduced to a total of about 8000.

The Shops Visited.

The tour of inspection, which occupied nearly three hours, commenced with a Lancashire boiler house which is used for coal testing. Then, in turn, the members passed through the steel foundries; the forging shops; the heavy turneries, where there are some of the largest lathes in the country; the central power station, in which are installed four 1500-kw. D.C. sets driven by steam generated in Babcock and Wilcox water-tube boilers fitted with mechanical grates; the hydraulic power house; the north boring mills; and the new drop-stamping shop, which is in course of construction. It is intended to equip this shop with gas furnaces—indeed, at the time of the visit, one furnace was already in operation. Then the visitors were shown the pipe-fitting and furnace shop, where some of the small gas furnaces are made and tested. In this shop a small high-temperature crucible furnace was seen under test. Thence the party passed through the gun gantries, where the naval guns are stored, into the light gun factories, which comprise machine and tempering shops. Inspection of the tempering shops and boring mills for the heavy guns, the miscellaneous machine shops, where the intricate parts of the carriages are produced, and the light forges completed a tour which, with its host of vivid impressions, will long remain in the memory of members of the London and Southern District Junior Gas Association.

Thanks to the President.

Tea was then served, after which Mr. A. Broadbent (Hon. Treasurer of the Association) proposed a vote of thanks to Mr. Reginald Townsend (the Chief Superintendent of the Ordnance Factories) and to Mr. Newton Booth and his assistants. Their President, said Mr. Broadbent, must feel very gratified with the excellent attendance.

Mr. A. S. Stainer (Brentford Gas Company) seconded the vote, saying that the visit had been regarded by the Association as a very real privilege.

Mr. Newton Booth said that, to any citizen of the British Empire, a visit to the Arsenal must prove of interest—an interest which must be all the greater when the citizen happened to be an engineer. The standard of engineering work carried out at the Arsenal had a beneficial effect on the quality of engineering generally. After expressing his pleasure at seeing so many present, he said that all such visits should be well attended. Each member owed it to himself and to the Association.

"Safety First."—"Safety First," the official journal of the National "Safety First" Association, is a monthly publication, at the price of 1s. to the public, though to members of the Association it is included as part of the subscription. A feature of the first issue is a "Foreword" by the Home Secretary (Sir William Joynson-Hicks, Bart.), who is President of the Association for 1925. The industrial side of the movement is dealt with in articles by Sir Thomas Legge (Senior Medical Officer, Home Office) and by the Association's Safety Engineer. The address of the Association is 119, Victoria Street, S.W.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Spirally-Guided Flying Lifts.

Sir,—With reference to the application for Patent No. 229,128/25 by Mr. William Blakeley for the application of spiral system flying lifts for guide-framed gasholders, extracts from which appeared in your issue for March 18, this is certainly not a new "invention," as Messrs. C. & W. Walker, Ltd., erected in 1897 a four-lift gasholder for the Guildford Gas Company, to designs prepared by the late Sir Corbet Woodall. The inner lift of this was 115 ft. in diameter by 24 ft. deep, and was spirally guided.

The first flying lift was, I believe, introduced by the late Sir George Livesey in connection with the Rotherhithe holder for the South Metropolitan Gas Company, some time before the East Greenwich holder was built; but this was not spirally guided. As a matter of fact, there is no advantage whatever, but several disadvantages, in adding spiral guides to the flying lift of a four-lift standard-guided holder.

R. J. Milbourne.

Lilleshall Old Hall,
near Newport, Salop.
April 6, 1925.

Mr. Philip Moon's Presidential Address.

Sir,—I regret to find that there was an error in the table of my Presidential Address [appearing at the bottom of the second column of p. 40 of the "Journal"] in which it states that a unit of electricity is equal to 3440 B.Th.U. The figure of equivalent therms—namely, 169·4 millions—is worked out on a basis of 3420 B.Th.U. per unit, which is, I think, nearer the accepted equivalent.

Philip G. G. Moon,
General Manager.

Bournemouth Gas and Water Company,
Poole Hill, Bournemouth,
March 31, 1925.

REGISTER OF PATENTS.

Coking Batteries.—No. 215,306.

Koppers Company, of Pittsburg (assignees of J. van Ackeren).

No. 22,805; Sept. 11, 1923.

Convention date: May 4, 1923.

This invention relates to coking batteries with heating walls operatively connected in pairs by ducts extending transversely of an intervening coking chamber, and reversible regenerators serving the heating walls. Batteries constructed on the above principle are described in the specifications of Joseph Becker, Nos. 171,117 and 205,459 [see "Journal," Vol. 168, p. 399].

This invention has for its primary object the provision of an oven embodying the transverse connection of heating walls, in a structure that may be operated either with coke-oven gas or as a combination oven, and yet may have the regenerators reduced to about one-half the number shown in the said prior specifications.

The invention provides the following simplifications and conveniences in construction and operation: Elimination of any supporting walls other than the usual pillar walls beneath the coking chambers; a workman is enabled to walk into a regenerator chamber, thereby greatly facilitating repairs and replacements; the heating walls and the coking chambers above the regenerators can be made of relatively great height with a relatively small increase in the height of the battery structure as a whole; and a reduction amounting to approximately one-half of the flow boxes and reversing devices required for controlling and reversing the flow of the various gases through the regenerators and flues.

Thirteen drawings and a full description are included.

Manufacture of Coal Gas and Water Gas. No. 229,042.

Neath, J., and Chaney, W., both of Victoria Street, S.W. 1.

No. 31,454; Dec. 14, 1923.

This invention relates to the manufacture of coal gas and water gas in apparatus of the kind in which one or more horizontal retorts for carbonizing coal is or are arranged to open at one end into a vertical water gas generator.

According to this invention the generator is divided and the two halves thereof with their retorts adapted to be worked alternately. In one phase steam is admitted to the generator at one side to make water gas, and this water gas mixed with rich coal gas is entirely passed to the hydraulic main. In the second phase air instead of steam is admitted to the generator to make producer gas, the main portion of which, together with a small proportion of low-grade coal gas, is passed to the combustion chamber surrounding the retorts, while the main portion of the low-grade coal gas together with a small portion of the producer gas passes to the hydraulic main either direct or through the horizontal retorts; the relative volumes of mixed gases passing to the combustion chamber and to the hydraulic main respectively in this phase being regulated by the pull of the chimney. The other generator and set of retorts are meanwhile working in the first phase. In the combustion chamber the gas meets the secondary air, then passes round the horizontal retorts, down to the bottom of the setting, round the water gas generator, thence to the recuperator, and on to the chimney; while the water gas on the other side either

goes through the horizontal retorts to the ascension pipes thereof, or direct to separate ascension pipes. In order to increase, if necessary, the temperature of the generator which is making water gas, a portion of the producer gas from the other generator, instead of entering the combustion chamber, may be passed into flues at the side of the generator, which convey it to other flues surrounding the bottom of the water gas generator, where a separate supply of secondary air is admitted for combustion.

The preliminary heating of the setting is obtained by means of gases from an outside source—say, from the adjoining bench of retorts, or from a separate water gas plant, so that the setting will not require a producer furnace for continuously heating the retorts with carbon monoxide; and after the setting is heated, no separate blow gases are used, heat being maintained by the combustion of the gas from the generator with a small proportion of coal gas as aforesaid. Inspection doors are arranged in the outer wall of the setting opposite each of the open ends of the retorts. The primary air and steam are both preheated before entering the generator.

Testing Pipe Joints.—No. 229,048.

Ross, D., and Weiser, R. F., both of Newport, and The British Mannesmann Tube Co., Ltd., of Queen Victoria Street, E.C. 4.

No. 32,110; Dec. 21, 1923.

This invention for testing joints in a pipe line relates to apparatus which comprises an expansible circular casing carrying an india-rubber or other resilient band or ring having lateral lips or projections forming in conjunction with the inner face of the piping a closed annular chamber in communication with a pressure gauge, means for expanding the expansible casing so as to force the resilient lips against the inner face to render the chamber fluid-tight, and means for admitting fluid under pressure into the chamber for the purpose of ascertaining from the pressure gauge whether or not there is leakage through the pipe joint.

According to the invention, the expansible circular casing consists of a split ring whose two ends overlap or are tongued; and means are provided for forcing the two ends apart to expand the casing.

The two end portions are provided each with a lug, and alternative devices for expanding the ring are: (1) An eccentric mounted on one of the lugs and adapted to be operated to bear against a part of the other lug and thereby force the two lugs on the end portions of the ring further apart. (2) A hydraulic cylinder and ram, in valved connection with a source of fluid pressure and carried by one of the lugs, the outer end of the ram being pivotally or flexibly connected with the other lug, so that when the ram moves outwardly in respect to its cylinder the lugs will be forced further apart. (3) A right and left hand screw bolt, whose ends are connected respectively with the two lugs, and means for turning the screw bolt in a manner to force the lugs further apart.

Retort Discharger.—No. 229,378.

Drakes Limited and Drake, J. W., both of Halifax.

No. 29,111; Nov. 19, 1923.

This invention relates to the well-known type of pusher discharger. The patentees' original invention, which is now modified, was specified in No. 2553 of 1908 [see "Journal," Vol. 104, p. 212].

According to the present invention, each side of the sectional push bar is formed of two series of links, and the propelling wheel for same has radial projections (which have their driving edges in the form of the teeth of spur wheels), and these projections are made to take between each pair of the two series of links which form the side bars, their positions on the peripheral face of the wheel being arranged for this purpose.

Another feature of the invention is the provision of detachable shoes for the links, which are subject to wear at the parts which slide over the retort surface.

Gas Governors.—No. 229,419.

Simpson, J. F., of Scunthorpe, and Peebles, W. C., of Bonnington.

No. 30,335; Dec. 3, 1923.

The invention relates to station governors, and has for its object to provide means for maintaining, so far as is possible, constant pressure at the points of use under varying demand conditions.

We reproduce a sectional side elevation of one form of the governor according to the invention. The bell A of a well-known type of station governor has a spindle B carrying the usual double-beat valves C, D, which, as usual, control the flow of gas through the valve apertures E, F. In order to isolate the bell A from pressure which surrounds the valves, a small inner bell G is arranged around the spindle B.

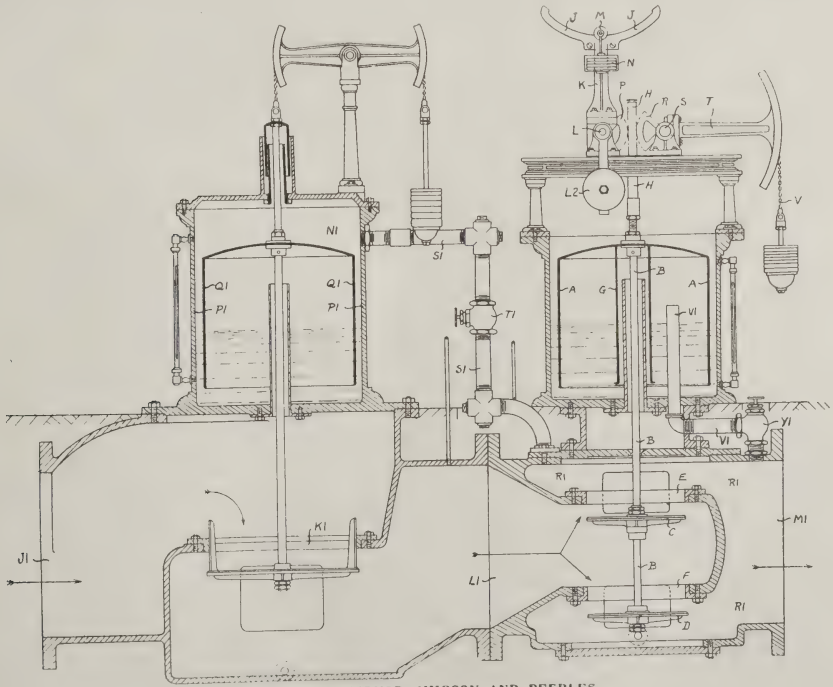
From the bell spindle B there extends upwards and through the bell-casing a toothed rack H; and to this there is operatively connected the weight-control mechanism. This mechanism consists of a curved track J carried on a lever K fixed upon a horizontal spindle L. The lever extends below the spindle, and on it is carried a weight L^2 counterbalancing lever and track. Upon the track runs a trolley M carrying upon a hanger a series of weights N by the removal or addition of one or more of which the pressure of operation can be rapidly adjusted. The lever and track are operatively connected by a tooth quadrant P fast on the spindle L and engaging the rack H with the bell A.

The bell A and its parts are partly counterpoised in the usual manner by a second toothed quadrant R engaging the rack H (which is toothed on two faces). This quadrant R is fast on a spindle S which has also fast on it the usual lever T with its quadrant and dependant chain-and-weight device V.

The effective area past the valve apertures E, F, may be varied by "hit-and-miss" or other devices, which are described and illustrated in the specification and are claimed as combined with the general arrangement.

Placed in series with and before the automatic governor is a differential governor of well-known type of which further description is unnecessary. Gas enters by its inlet J^1 and passes through valve K^1 to the inlet L^1 of the automatic governor, and thence by way of its valves to the outlet M^1 of that governor. The space N^1 within the closed and sealed casing P^1 of the bell Q^1 of this differential governor, is, however, connected with the space R^1 on the delivery side by a pipe S^1 in which is a valve T^1 adapted for fine adjustment and small areas.

The space beneath the bell A of the automatic governor is connected by a pipe V^1 with the outlet pressure by way of a needle valve V^1. Two needle valves in parallel may be provided; a small one for that



A STATION GOVERNOR—SIMPSON AND PEEBLES.

very fine adjustment required when the combination is used, and a larger one for employing the governor as an ordinary static governor. To this end the needle valves Y^1 may also be provided with pointers and dials for indicating their positions.

Control of Water Gas and Other Cyclical Processes. No. 229,399.

Humphreys & Glasgow, Ltd., and Stelfox, J. C., both of Victoria Street, S.W. 1.

No. 29,503; Nov. 22, 1923.

This invention relates to very complete automatic control of water gas plant, &c. The arrangement is described in detail with reference to 15 drawings, and there are 19 claims; so we cannot do more than indicate the scope of the patent by extracts from the introduction.

The patentees say that it is a comparatively simple matter to arrange for the movement of the operating valves by means of hydraulic or other power, and it is assumed that such power is continuously available. The problem is, however, complicated by the fact that not only must the routine opening and closing of the various operating valves be effected in proper time and sequence, but efficient operating conditions must be maintained in the generator, and (for carburetted gas) in the fixing chambers, and (with waste-heat boilers) in the production of the steam, notwithstanding the variations in the quality and character of the solid and fluid gas-making materials, and of the gas to be produced. Above all, there must be no danger of explosion.

To overcome the dangers and disabilities attaching to all previous attempts to operate water-gas plant mechanically, the present invention not only ensures automatic change in accordance with the predetermined cycle of operation, but also repuires that the various valves actually respond to the call of the mechanism automatically directing the operation of the plant, which mechanism may be referred to as the "automatic operator." Thus, if a valve sticks or for any cause does not sufficiently complete its proper movement, the cycle is automatically stopped, so that no succeeding valve can move when any valve has failed to function—thus eliminating the danger of explosion which would otherwise exist. Coincident with the stoppage of the cycle, the supervisor is automatically notified of the stoppage and just what valve has failed, so that the trouble may be promptly corrected without danger or delay in locating it.

Furthermore, in case any valve fails to perform its movement at the proper speed, the cycle is likewise automatically stopped, and the stoppage notified—thus preventing losses and troubles otherwise occasioned by sluggish movement of any valve.

Moreover, in case of the failure of any valve to function properly, the invention also includes the automatic and safe shutting-down of the plant (except the delinquent valve, if otherwise stuck) and notification to the supervisor of such shutting-down and of just which valve has failed. Failure of the power driving the automatic operator may also cause shutting down the plant automatically and safely, notifying the supervisor.

In addition, the timing of movement of any or all of the operating valves may be immediately modified; and any or all of the following operations may be instantly suspended or resumed (or hand controlled), as may be necessary from time to time to attain the most efficient conditions for making water gas (either blue or carburetted to any desired quality), without interference with the inherent safety of the apparatus—namely:

(*a*) Down-running (in accordance with clinkering necessities).
(*b*) Secondary combustion (to govern temperatures in fixing chambers).
(*c*) Secondary combustion (of surplus CO for steam production).
(*d*) Oil supply (in accordance with quality of gas desired).

The invention provides for automatic charging of fuel to the generator, which may be likewise regulated or suspended or hand-controlled at will without interference with the inherent safety of the invention; and also for instant substitution at will of hand-control (with the actual response of each valve completely indicated and preferably in interlocked sequence) for automatic operation of the plant.

Gas Meters.—No. 229,512.

Kirkewhite Engineering Co., Ltd., and Goldspink, G. E., both of Nottingham.

No. 6680; March 15, 1924.

This invention relates to the means for attaching gas-meter diaphragms to the rim. A binding wire is used which has turned ends engaging holes in arms which are mounted on a hinge pin fixed to the rim. These arms are connected to each other by a screw or bolt which is adapted to draw the arms together and tighten up the binding wire.

As a combination with the above, the patentees claim a post in the diaphragm plate provided with a sleeve at its outer end at right-angles to the main part, and a "flag" or arm having its end jointed to the post by means of a joint pin passing through the sleeve and bearings on the flag or arm, so that the latter can be disconnected by removing the joint pin.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for April 1.]

Nos. 7712-8382.

British Mannesmann Tube Company, Ltd.—"Pipe joints." Nos. 7740, 7833.

Keith, G., and Keith & Blackman Company, Ltd., J.—"Gas governor." No. 8228.

Keith, G., and Keith & Blackman Company, Ltd., J.—"Dust-separating apparatus." No. 8229.

Schofield, D. L.—See British Mannesmann Tube Company, Ltd. Nos. 7740, 7833.

Townsend, W. W.—"Ventilation of gas-consuming apparatus." No. 7815.

Weyman, J. E.—"Means for drying, screening, and treating neutralized sulphate of ammonia crystals." No. 8083.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Bills read the third time, passed, and sent to the Commons: Horley District Gas Company (Electricity Supply) and the Rochdale Corporation.

Hoylake and West Kirby Urban District Council Bill: Reported from the Select Committee, with amendments.

A Select Committee has been appointed to consider the Mansfield Corporation Bill, and will meet on Wednesday, May 13.

HOUSE OF COMMONS.

Progress of Bills.

Bills reported, with amendments: Gas Light and Coke Company, Stockton-on-Tees Corporation.

Bills read the first time, and referred to the Examiners: Horley District Gas Company (Electricity Supply), and Rochdale Corporation.

Gas Regulation Act.

Copies were presented of drafts of Special Orders proposed to be made by the Board of Trade under section 10 of the Act, on the application of the East Grinstead Gas and Water Company and the Slough Gas and Coke Company.

Bye-Products.

Colonel Crookshank asked the Secretary for Mines whether he could furnish any information as to the possible value of the oil and other important bye-products obtainable from coal; and if there was any reasonable prospect of their being successfully extracted, in view of the waste represented in this direction.

Colonel Lane-Fox said that, if the question related to processes of low-temperature carbonization, he would draw attention to the reply on Feb. 10. The value of these processes obviously depended upon the extent to which they could be operated commercially at a profit; and the Government would spare no efforts to assist in developing them and endeavouring to make them a commercial success.

Motor Spirit and Benzole.

Mr. D. Grenfell (for Mr. George Hall) asked the President of the Board of Trade whether he could give the total number of gallons of motor spirit, including benzole, used in the British Isles in 1913 and 1924; and the total number of gallons of home-produced benzole used as motor spirit in 1913 and 1924 respectively?

Mr. A. M. Samuel, in reply, said that precise information as to the consumption of motor spirit, including benzole, could not be furnished. From such particulars as were available, it might, however, be estimated that the consumption in 1913 was approximately 120,000,000 gallons, and in 1924 approximately 500,000,000 gallons. The information available did not enable a similar comparison to be made of the consumption of home-produced benzole as motor spirit.

HORLEY DISTRICT GAS (ELECTRICITY SUPPLY) BILL.

(*Concluded from p.* 66.)

Tuesday, March 24.

Mr. Tyldesley Jones, continuing his address to the Committee, said that nothing had been more striking than the way the scheme of the Gas Company had altered since its original conception. It had been said by Sir Harry Courthope-Munroe that the utilization of waste heat was the keynote; but when Mr. Seabrook had given evidence, they had found that it was nothing of the sort, because it was not at first the intention to utilize waste heat. The whole Bill was an attempt to put a restraining hand upon the activities of any electrical undertaking which might be introduced into this district. The site of the generating station had been altered since the original conception, and it was now proposed to erect the station on the gas-works site, which, he suggested, was already overcrowded. Even if the Bill were passed, the Gas Company would have to get the consent of the Electricity Commissioners to the erection of the generating station; and before the Commissioners gave their consent, they would require plans. The real matter the Committee had to consider was under which scheme would the consumer benefit most. The Gas Company proposed to charge 10d. per unit for electricity, and this was the maximum price asked for by the Electricity Company, so that there was nothing between them as to price. But, whereas the Electricity Company had a strong incentive to effect economies and reduce the price, in order to increase business, the Gas Company had not, because increases in the sale of electricity would to some extent be at the expense of gas. The gas undertaking was operated under the sliding-scale, by which increased dividends could only be paid if the price of gas were reduced; but no such sliding-scale was attached to the electricity undertaking. If the Gas Company kept-up the price of electricity, they would get more money from the electricity consumers, and, at the same time, would place gas in a more advantageous position to compete with it. With regard to the Gas Company's estimates, he said that the estimated cost of generation in the first year was £373. Of this, £300 represented maintenance and repair of plant, and wages, and £73 represented the cost of fuel for generating one-quarter of the electricity produced. He suggested that the cost of the fuel would be another three times as much, so that £220 should be added; and this would make the total generating costs £593. Also, nothing had been credited to the gas-works for the value of the waste heat which would be used, and nothing had been allowed for insurance, which latter was a big item. As to the

statement that 21 gas companies had been granted electricity powers, he said that many of them had not supplied electricity until some years after they had received powers. Even the Yorktown and Blackwater Gas and Electricity Company had not supplied electricity until twelve years after receiving powers. He suggested that the reason why these companies had at last given a supply was that, if they had not done so, their powers would have been revoked, and they would have had to face competition. A suggestion had been made to obtain a bulk supply at Horley from the Southern Railway Company; and when the railway was electrified, as it would be, no doubt the proper thing would be to get a supply in bulk. Then the advantages of generation of electricity by the utilization of waste heat would not exist. The very fact of the opportunity of obtaining a bulk supply later would be a good argument for the Gas Company to do nothing.

Mr. *R. L. Norris* (Chairman of the Electricity Company, and a member of the Reigate Rural District Council) gave evidence as to the need for electricity in Horley, and the formation of the Company by the local residents. £10,400 had been subscribed; and if the Electricity Company's scheme were not proceeded with, their money would be thrown away.

Sir Harry Courthope-Munroe, cross-examining, pointed out that it was equally true that, if the Bill were refused, the Gas Company's expenditure would be wasted.

Evidence was also given as to the need for a supply, and as to the formation of the Electricity Company, by Mr. J. H. Robinson, Mr. C. G. Selfe, and Mr. A. C. Rowson—all Directors of the new Company, and residents of Horley.

Mr. *C. R. St. John* (Consulting Engineer, Westminster) said he was invited to attend a Committee meeting in Horley on Feb. 12, 1923, and was asked to advise generally with regard to the electricity supply in Horley and the neighbourhood. The scheme which had been prepared previously by another engineer had been rejected, because he had reported that it was on far too small a scale for Horley; and he was asked to submit an alternative one. After surveying the district, he had concluded that alternating current was the proper method of supply. It was desirable to obtain a bulk supply if possible, and his negotiations had been delayed as the result of his attempts to obtain it; but these attempts had not been successful. When the railway was electrified, places such as Horley would be able to get a bulk supply from the Southern Railway Company, and his plan was an endeavour to tide-over the period before that. His scheme consisted of a generating plant driven by an oil engine on a site near the railway station, and the distribution system was 415 to 240 volt, 3-phase, 4-wire, 50-cycle. His report was adopted by the Committee, and the decision was then made to form the Company. They had decided to proceed with the Company from the end of July, 1924. He then handed-in tables showing the estimated results and expenditure involved by his scheme. In the first year he estimated 120 consumers, in the second year 220, and in the third year 300; and the total estimated revenues for those years, including units sold, meter rents, wiring sales, and hire service, were £2200, £3900, and £5600 respectively. In the first year there would be a deficit of £335, in the second year all charges would be met, and in the third year a profit would be made for the first time. His estimated gross profit for that year was £1250. With regard to capital expenditure, this was estimated at £12,800 for the first year, £6800 for the second, and £2400 for the third. As to the charges for current, consumers would have the option of taking lighting at 10d. per unit, and power for heating and cooking at 2½d., or of paying a fixed quarterly sum for the installation, based upon the floor space of the house, *plus* 1½d. per unit for all current used for any purpose. The latter system would enable duplicate wiring to be avoided. This system had worked-out successfully in other undertakings of which he knew. It was proposed that the Company should have power to undertake the wiring of houses; and he regarded these powers as necessary where it was desired to develop a district rapidly. He knew of no undertaking which had made a profit in the first year. He was quite satisfied that the Company could give a satisfactory supply for as long as the supply was generated locally, and was so favourably impressed with the proposition that he had made an offer to subscribe one-half of the capital, or, if less than £10,000 were subscribed, to find £5000. He was also prepared to take his consulting fees to a large extent in the form of shares.

Cross-examined by Mr. Abady, he said he had been connected with a scheme for electric supply in the Wirral Rural District, where the Electricity Commissioners had held an inquiry to consider competitive schemes; and he agreed that this was an example of the fact that, where there were competitive schemes, it was usual to hold an inquiry. Mr. Abady also cross-examined with regard to an estimate of sales in the Company's prospectus, the estimate in witness's report put before the Electricity Commissioners, and the estimate now put before the Committee, to show that they all disagreed. Counsel suggested that there was practically no evidence from existing undertakings to support witness's optimism that he would sell 225,000 units in the third year, as he had estimated.

Mr. *John C. Dalton* (Ministry of Transport) gave evidence with regard to the Order made by the Electricity Commissioners in favour of the Electricity Company. Asked by Sir Harry Courthope-Munroe why the Order had been promulgated without the Gas Company being heard, he said that the Commissioners had had to consider the Electricity Company's scheme alone because the Gas Company had merely said that the Directors had had under consideration the question of obtaining powers to supply electricity, and had submitted no scheme of their own.

Mr. *M. J. Collins* (representing the Electricity Commissioners) said that the only application before the Commissioners was the application of the Electricity Company. The Gas Company had raised objection, but had given no reasons beyond the fact that they were competitors of the scheme. Objections had been raised by others with regard to the site for the generating station; and an inspector visited Horley to inspect the site, and had given the objectors an opportunity of being heard. He believed one of the objectors was the Chairman of the Gas Company, and he had had a notice that the inquiry was being held, so that the Gas Company must have known.

Sir Harry Courthope-Munroe stated that the Commissioners had been informed that the Gas Company had definitely decided to apply for powers

Witness remarked that the present position was probably unique, in that there was one application before the Commissioners and another before Parliament, for supplying the same area.

Sir Harry Courthope-Munroe suggested that, had the matter been before the Board of Trade, who dealt with these matters before the passing of the Electricity (Supply) Act, 1919, instead of the Electricity Commissioners, they would not have made the Order, but would have shelved it until they had ascertained what was the intention of Parliament.

Witness was of opinion that the Board of Trade would have acted in the same way as had the Commissioners.

Sir Harry Courthope-Munroe, in reply to the Chairman, said that the Gas Company had had no notice of the inquiry at Horley. This had nothing to do with the scheme, and it was not an inquiry under the Electricity (Supply) Act; it simply had to do with the site.

Mr. *W. Sidgwick* (Messrs. Rees & Freres, Parliamentary Agents) said there were cases in which a department had done what the Electricity Commissioners had done in this case—namely, dealt with the Special Order without waiting for the decision of Parliament on the Bill. The Order, if sanctioned by the Minister of Transport, would have to be confirmed by Parliament, so that the latter would have an opportunity of considering the two together. The Electricity Commissioners could only consider the scheme before them.

Sir Harry Courthope-Munroe said it seemed that, though the Gas Company had lodged an objection to the Electricity Company's Order, they had not stated that they wished to be heard upon it, notwithstanding that the Order was in competition with the Gas Company's Bill. Surely it was not thought that the Gas Company did not wish to be heard.

In his final speech to the Committee, Sir Harry said that the suggestion made by the Electricity Company, that the Gas Company made their application in order to restrain electrical development, was ridiculous. Development in the realm of electricity was a post-war matter. Mr. Randall had joined the Board of the Company in 1922, holding very strong views on the desirability of joining-up electricity and gas supply, and at that time had no knowledge of the first scheme prepared by the Electricity Company. He had heard about it afterwards, and this had accentuated his view that the time was ripe for the Gas Company to apply for powers. The Gas Company were first in the field, and had stolen nobody's case. It had been said that the most important matter was the interest of the consumers, and he was absolutely in agreement with that view; it was the test upon which the Bill should stand or fall. It was beyond dispute that the existing Gas Company, if the Committee thought they honestly intended to give the supply, were infinitely better fitted to carry it out than the new Company. The Electricity Company had been able to call only one engineer, whereas the Gas Company had the support of eminent engineers in Mr. Broadberry, Mr. Gill, and Mr. Seabrook. The capital to be raised by the Gas Company for the electricity undertaking would have to be sold by auction, and the premiums obtained as a result would be used for the purposes of the electricity undertaking without any charge upon it. He quoted at length from the evidence of witnesses on behalf of the Gas Company, and asked the Committee, having regard to the nature of that evidence, to allow the Bill to proceed.

After the Committee had consulted in private,

The Chairman asked how long it would take the Gas Company to complete the undertaking, in order that a supply of electricity could be given.

Sir Harry Courthope-Munroe said that it would take twelve months from the date of Royal Assent to the Bill.

The Chairman said that in that case the Committee found the preamble of the Bill proved, but that it be an obligation upon the Gas Company to complete the works so that the supply could be given in the compulsory area in twelve months from the date of Royal Assent.

The Gas Engineer advising the Electricity Company was Mr. Arthur Valon (Messrs. W. A. Valon & Son, Civil Engineers, Westminster), but he was not called upon to give evidence.

STOCKTON-ON-TEES CORPORATION BILL.

This Bill was considered by the Unopposed Committee of the House of Commons, presided over by Mr. James F. Hope (Chairman of Ways and Means), on Wednesday, April 1, and was ordered to be reported for third reading. The purposes of the Bill are to enable the Corporation to purchase by agreement the undertaking of the Haverton Hill-on-Tees Gas Company, Ltd., which Company supply gas in part of the Urban District of Billingham, adjacent to the existing gas supply limits of the Corporation; to extend the limits of supply of the Corporation to include so much of the Urban District of Billingham as is not already within their limits, and the township of Cowper Bewley; and to confer further powers upon the Corporation with regard to the supply of electricity and consolidation of rates (see "Journal" for Jan. 14, p. 83).

Mr. H. Gibbon Pritchard (Messrs. Sharpe, Pritchard & Co., Parliamentary Agents) said that the purchase had been undertaken with the agreement of the Billingham Urban District Council. In reply to the Chairman, he said that the whole of the area of the Company was outside the Borough of Stockton, but about half of the Urban District of Billingham was at present within the limits of supply of the Stockton Corporation.

Mr. *Arthur Valon* (Messrs. W A. Valon & Son, Civil Engineers, Westminster), who advised the Corporation in connection with the purchase, said he had examined the Haverton Hill Company's undertaking, and was satisfied that the price proposed to be paid for it—namely, £24,155—was a favourable one for the Corporation. He had made a valuation of what it would cost to replace the plant (works, mains, meters, and stoves) at the present time, and his figure was £33,286.

A series of reports on the Bill from the Board of Trade, Home Office, and Ministries of Health and Transport was then dealt with.

One suggestion in the Board of Trade report, relating to the extension of the gas limits of the Corporation, was that, if any part

of the extended limits of supply was at present supplied with gas by a non-statutory undertaking, the Corporation should be restricted from supplying gas in such area until they should have come to an agreement with the non-statutory undertaking. Mr. Pritchard said that the only recognized company really supplying gas was the Haverton Hill Company. He understood, however, that there were one or two private streets in the new area of supply which were now supplied by Messrs. Dorman Long & Co., Ltd. The Corporation did not propose to supply there unless this firm wished them to do so, but there was a provision in the Bill enabling the Corporation to enter into an agreement with the firm, or any other persons who happened to be supplying gas within the Corporation's limits, to purchase the mains and pipes, and the goodwill attaching to the business, or to pay compensation to those persons for giving up their rights to supply. In reply to Sir Ernest Moon, K.C. (a member of the Committee), Mr. Pritchard said that Messrs. Dorman Long & Co. had not raised any objection. They were well acquainted with Parliamentary procedure, and, therefore, he assumed they were satisfied with the Corporation's proposals.

Another clause to which reference was made in the Board of Trade report was that relieving the Corporation from the obligation to supply gas for other than lighting or domestic purposes from any main the capacity of which was insufficient; and the report pointed to the negotiations now taking place between the National Gas Council and the railway companies, with a view to arriving at an agreed form of clause. The form of the clause inserted in the present Bill, said Mr. Pritchard, was that which the railway companies had asked for in the Barnsley Order and the Chesterfield Act two years ago, but the railway companies had since discovered a further objection to the clause. In view of the negotiations referred to above, the Corporation had given an undertaking to the London and North Eastern Railway Company that they would accept any clause which the railway companies and the National Gas Council might agree upon. In the meantime, he asked the Committee to allow the clause already in the Bill to remain; and the Railway Company raised no objection to this. Asked by the Chairman when the new clause was likely to be settled, he said he could not hazard a statement on this, though he had seen what he believed was practically the final form of the clause. The Corporation had, however, given the Railway Company an undertaking that, should the matter not be settled by the time it was necessary to petition against the Bill, if they wished to, in the other House, the Corporation would raise no objection to the Railway Company's depositing a petition.

The Committee agreed to this suggestion.

Another clause to which reference was made in the Board of Trade Report was to enable the Corporation to refuse to supply gas or electricity to any person whose payments for the supply of either were in arrear, whether such payments were due to the Corporation in respect of a supply to the premises in respect of which such supply was demanded, or in respect of other premises. The Board of Trade report stated that the clause was much wider in its scope than clause 32 of the House of Lords Model Bill, and would enable the Corporation to cut off the supply of gas and electricity in the event of payments being in arrear in respect of either commodity supplied to any premises, occupied by the same consumer, irrespective of the circumstances under which, and the period for which, the payments might be in arrear.

Mr. Pritchard said that the Corporation supplied both gas and electricity, and wanted to deal with the consumer who (say) was taking a supply of electricity and did not pay for it, and who, when back payments were demanded, said he would not take any more electricity but would have a supply of gas. If that consumer were prepared to enter into a contract with the Corporation for a supply of gas, the Corporation were at present bound to enter into that contract, and to expend the capital necessary to enable the supply to be given. There was also a report from the Home Office which raised this point, and which stated that similar provisions were disallowed in the Chesterfield and the Swanage Gas and Electricity Bills of 1923. The matter had been threshed out at great length recently by a Committee of the House of Lords (presided over by the Earl of Clarendon) in the Hoylake and West Kirby Urban District Council Bill (see "Journal" for March 25, p. 749). The Director of Gas Administration at the Board of Trade had laid his objections before that Committee, but the Committee had unanimously granted the clause, and had granted it again in the Nottingham Corporation Bill.

The Chairman asked the effect of the model clause.

Mr. Pritchard replied that it provided that, if a consumer of gas had not paid his accounts, then the gas authority might refuse to supply him with gas. It did not meet the case of the consumer who would not pay his bill for one commodity, and demanded a supply of the other.

Sir Ernest Moon, K.C., pointed to a statement in the Home Office report that Committees had generally taken the view that the powers of one undertaking should not be used as a lever to obtain payment of money due in respect of the other.

Mr. Pritchard, in reply to the Chairman, said the consumer was safeguarded, because, if the Corporation cut off the supply of either gas or electricity, and it was found that there was good reason why the consumer had not paid his bill, then the Corporation were liable for heavy damages.

The Chairman announced that the Committee did not raise objection to the insertion of the clause.

A stand-by clause in the Bill, which the Board of Trade suggested should be amended to follow as far as possible the provisions of the Electricity (Supply) Act, 1922, with a view to uniformity, was withdrawn by the promoters.

With regard to a clause giving the Corporation power to specify the size and material of the pipes and fittings between the main and the consumer's meter, the Board of Trade suggested that there should be substituted a clause usually inserted in special Orders in accordance with the recommendation of a conference at the Board of Trade on Feb. 8, 1923, at which representatives of local authorities and of gas undertakings were present. Mr. Pritchard said that the clause in the Bill at present was taken from the House of Lords Model Bill, and only dealt with pipes and fittings between the main and the consumer's meter, which was all the Corporation desired to have power to deal with. The clause suggested by the Board of Trade would enable the Corporation to deal with pipes and fittings throughout the consumer's premises, but, to do this, they had to advertise in the "London Gazette" and in two local newspapers; they were subject to a reference to an independent gas engineer; and, if he thought fit, a local inquiry would be held, before the Corporation could do anything under the clause. The Corporation were content with the lesser power, in order to avoid that trouble. Incidentally, the consumers in Stockton had had no notice of a suggestion that the Corporation should be entitled to deal with the fittings in their houses, and it would scarcely be fair to the consumers for the Corporation to take this power.

The Committee agreed to the Corporation's proposal.

There was some discussion with regard to the suggestion in the report of the Ministry of Health that the period for repayment of the £24,155 to be borrowed for purchasing the Haverton Hill undertaking (40 years was inserted in the Bill) was too long.

Mr. Pritchard suggested that that period was not too long. In the case of the Hoylake and West Kirby Urban District Council Bill the period asked for in respect of money borrowed for purchasing an undertaking was 60 years, and the Ministry of Health had suggested 40 years. The Stockton Corporation asked for 40 years, and the Ministry suggested 35, and it was to be inferred that the Ministry always suggested a shorter period than that asked for by promoters. In the present case the Corporation had been very moderate. The undertaking to be purchased had a large future before it, and there were big prospective profits to be earned. Thus, the future ratepayer would have more revenue than the present ratepayer for meeting the repayments of sinking fund and interest on the loan, and it seemed a little hard that the present ratepayer should be burdened, as he would be if the period of repayment were reduced, when he would not have the benefit of the revenue from the undertaking.

The Chairman asked what the profits on the Haverton Hill undertaking were at present

Mr. *Valon* said the profit in 1924 was £2084, and in 1923, £2209.

Mr. Pritchard pointed out that the Corporation had agreed to reduce the price of gas.

Mr. *Valon*, in reply to Sir Ernest Moon, said the present price in the Haverton Hill Company's area was equivalent to 13·5d. per therm; after transfer the price would be 9·2d. per therm—a drop of over 4d. Asked if the plant were up-to-date, he said that the Corporation would manufacture gas at Stockton, but would use the gasholders, mains, meters, and small plant of the Haverton Hill Company. This plant was quite good. Many mains had been laid recently, and they were larger, on the whole, than one would expect to find in an undertaking of the size.

The Committee agreed to allow a period of 40 years.

As to the period of repayment of the loan necessary to defray the costs and expenses incidental to the transfer of the undertaking, for which 40 years was asked originally, the Ministry of Health suggested a shorter period. Mr. Pritchard said that he understood there was very little physical work to be carried out, except for connecting up mains, and the Corporation were prepared to accept 20 years.

Mr. Thomas Downey (Town Clerk of Stockton) proved the preamble of the Bill, which, as stated, was ordered to be reported.

BEXHILL CORPORATION BILL.

One of the objects of this Bill is to empower the Bexhill Corporation to acquire compulsorily, or by agreement, the undertaking of the Bexhill Gas and Water Company (see "Journal" for Jan. 14, p. 83). There was a petition deposited against the Bill by the Company, but when it reached a Committee of the House of Lords, presided over by the Earl of Clarendon, on Wednesday, March 25, Sir Lynden Macassey, K.C., (for the Corporation) said he was very glad indeed to be able to say that, as the result of negotiations which had taken place between the Corporation and the Company, agreement had been arrived at. Provision would be made by that settlement for the transfer of the undertaking to the Corporation, and the main terms of the agreement had been negotiated. He suggested that the Committee should allow that part of the Bill dealing with the transfer to proceed in its original form, and, when the Bill reached the Lord Chairman, and the agreement was finally reduced to formal language, the promoters would ask the Lord Chairman to include it in the Bill in substitution for the compulsory clauses. The Lord Chairman would be asked not to report the Bill to the House until that had been done.

Mr. Jacques Abady (for the Bexhill Gas and Water Company) agreed to this course.

ROCHDALE CORPORATION BILL.

This Bill has been under consideration by a Committee of the House of Lords, presided over by the Marquess of Bath, and has been ordered to be reported for third reading.

The clauses relating to the gas undertaking of the Corporation remain as indicated in the "Journal" for Jan. 28, p. 210, with the exception of one clause. This provided that if, in the opinion of the Corporation, any waste of gas or injury or risk of injury to person or property was caused, or likely to be caused, by a defective fitting, the Corporation could carry out the necessary repairs, at the expense of the consumer or house owner. The terms of the clause (it was set out fully in the "Journal") were considered by the Board of Trade to be too wide; and the following clause, which gives the Corporation power to compel repairs only in case of danger, has been substituted:

> If the Corporation shall at any time serve notice upon any consumer to the effect that an officer or servant of the Corporation has reported, after inspection of any internal piping or gas-consuming appliance or fitting on such consumer's premises, that he is of opinion that any such internal piping or gas-consuming appliance or fitting is in such a condition as to be dangerous to the occupiers of the premises, such consumer shall forthwith

carry out such works as may be necessary to remove the cause of danger. If the consumer shall fail forthwith to carry out such works as aforesaid, the Corporation may stop the gas from entering the premises of such consumer by cutting-off the service pipe or by such other means as the Corporation shall think fit. Any expenses incurred by the Corporation in cutting-off the gas from such premises may be recovered by the Corporation summarily as a civil debt.

WOLVERHAMPTON CORPORATION BILL.

One of the objects of this Bill (which was considered by the Local Legislation Committee of the House of Commons recently) was to authorize the Corporation to carry out various street works. A petition was deposited against it by the Wolverhampton Gas Company, with a view to securing protection for their apparatus; but opposition was withdrawn on the insertion of a protective clause. This clause provides that before commencing any authorized work in any street or road within 10 ft. of any of the Company's apparatus, the Corporation are to give fourteen days' notice to the Company, and to deliver plans of the work for reasonable approval. If no objection is raised by the Company within fourteen days, they shall be deemed to have approved. The Corporation are also to give the Company any further information reasonably required. If it appears to the Company that the execution of the proposed works would interfere with or endanger their apparatus, or unreasonably interfere with access thereto, or impede the supply of gas, they may, within the fourteen days, give the Corporation notice to alter the position of such apparatus as may be reasonably necessary, any difference as to the reasonable necessity of such alteration or the manner of carrying it out to be settled by arbitration. Such alterations are to be carried out by, and at the expense of, the Corporation, with as little detriment and inconvenience to the Company as the circumstances will admit, and to the reasonable satisfaction of the Engineer to the Company.

The Corporation are not to remove or displace any apparatus, or do anything to endanger it, impede the passage of gas through it, or interfere with access thereto without the consent of the Company, or in any other manner than the Company shall approve, until they have substituted other apparatus, at their own expense, and to the reasonable satisfaction of the Engineer of the Company.

Whenever, by reason of the exercise of the powers conferred on the Corporation, any apparatus other than that for which new apparatus has been substituted is rendered derelict or unnecessary, the Corporation are to pay the Company the agreed value of that apparatus, or the value as determined by arbitration; and the apparatus is to become the property of the Corporation. The Corporation are also to pay the reasonable cost of cutting-off that apparatus from other apparatus.

The Corporation are to make good any damage done to apparatus, or to make full compensation to the Company for any loss, damage, costs, or expenses which the latter may sustain. The Company may carry out alterations if they so desire, at the expense of the Corporation, if they give seven days' notice.

LEGAL INTELLIGENCE.

AN OXYGEN DISPUTE.

Judgment.

On Monday, Mr. Justice Romer delivered judgment in the action brought by the British Oxygen Company, Ltd. [See *ante*, p. 67.]

His Lordship said the plaintiffs were manufacturers and sellers of oxygen, and the defendants were manufacturers and sellers of plant capable of manufacturing oxygen gas. In December, the defendants approached Tanks & Drums, Ltd., with a view of inducing them to purchase plant by which they could manufacture oxygen for themselves, instead of purchasing it from the plaintiffs. To counteract this move, the plaintiffs offered to supply Tanks & Drums, Ltd., with oxygen at a reduced price, and stated that if the offer was not accepted by a certain date the price would be greatly increased. Unfortunately, this letter was handed by the Manager of Tanks & Drums, Ltd., to a representative of the defendants; and they caused twelve photographic copies to be made, one of which was sent to a London stockbroker for the purpose of showing what the plaintiffs were prepared to do to try to obtain customers. The plaintiffs, when they discovered the use to which the letter was being put, brought their action for an injunction, on the ground that their copyright was being infringed, and that the letter was confidential. The jurisdiction of the Courts to grant such relief was settled as long ago as the time of Lord Hardwick. It had been urged on behalf of the defendants that the letter was not a literary work; but he did not agree with this submission. He thought the plaintiffs had a copyright in the letter, and to make copies of it was an infringement of their right. A further point taken on behalf of the defendants was that no relief could be granted, as the act of the plaintiffs was against public policy and in restraint of trade. Plaintiffs were justified in endeavouring to retain their customers by offering a reduction in price so long as these customers took all their oxygen from them. It was further said that the defendants' object in doing what they did was to clear themselves, and to vindicate their character. He thought, however, it was clear that the object was not to vindicate themselves, but to attack the commercial character of the plaintiffs' Company. The act of the defendants being unlawful, he must grant an injunction restraining them from publishing, printing, circulating, or exhibiting, or causing to be published, printed, circulated, or exhibited, the letter in question, or from otherwise infringing the plaintiffs' copyright therein.

As the parties had agreed to treat the motion as the trial of the action, there would also be an order for delivery up to the plaintiffs of any copies of the photographed reproduction of the letter in the possession of the defendants; and the defendants must pay the costs.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

There have appeared in the "London Gazette" the following notices regarding applications to the Board of Trade under the Gas Regulation Act.

SPECIAL ORDERS.

Devizes Corporation.

The Corporation are applying to the Board of Trade for a Special Order to authorize them to use scheduled land for gas purposes and to purchase additional lands; to define the limits of supply; to enable them to borrow further money; to establish the thermal basis of charge; to make regulations in connection with the supply of gas; and for other purposes.

Newark Corporation.

Application is being made by the Corporation for an Order under section 10, to empower them to acquire the undertaking of the Newark Gas Company; to construct a railway siding to the works; to define the limits of supply; to borrow money; and to confer various other powers upon them in connection with the carrying-on of the undertaking.

Ormskirk and District Gas and Electricity Company.

A Special Order is being sought by the Company, to give them authority to borrow further money; to enable them to set aside sums for a capital redemption fund; and to confer general powers.

GAS REGULATION ACT ORDERS.

The Director of Gas Administration has forwarded a copy of the following further Order made by the Board of Trade under section 1 of the Gas Regulation Act.

Aberdeen Corporation.

The Order is in the usual terms, but with no price figure inserted. [March 27.]

SOUTH METROPOLITAN GAS COMPANY'S BASIC PRICE.

Suggested Revision Application by the L.C.C.

At last week's meeting of the London County Council (replying to questions by Mr. J. D. Gilbert), Mr. Cyril H. M. Jacobs (the Chairman of the Public Control Committee) stated that the Committee would submit a report to the Council concerning the notice issued by the South Metropolitan Gas Company relative to the price of gas. The report, which appeared in this week's agenda, is in the following terms.

A question was raised in the Council on March 25, 1925, regarding the recent increase from 8d. to 8¾d. a therm by the South Metropolitan Gas Company in the price of the gas supplied by them, such increase to take effect as from the date of reading the meters for the Lady Day quarter. As the matter is one of public interest we report the facts.

Successive reductions were made by the Company in question in the price charged for gas between Michaelmas, 1922, when the price stood at 11½d. a therm, and Michaelmas, 1923, when the price reached 8d. a therm. The Company attribute the necessity for the recent increase in price to the heavy fall in the receipts from bye-products, and to the increase in wages paid from the beginning of the year.

The price charged for gas is primarily dependent on the cost of production and distribution. No advantage is likely to accrue to the shareholders of the Company by reason of an increase in the price charged, since the dividend is limited by Act of Parliament. Under the South Metropolitan Gas Act, 1920, the price charged may include provision for a dividend of 5 p.ct. on the existing ordinary stock, and 6 p.ct. on any new ordinary stock which may be issued in future; but any addition to these dividends must be accompanied by a reduction of the price of gas below the "basic" price, which was fixed by the above-mentioned Act at 11d. a therm. The Act provides that, after allowing for the above authorized dividends, any "surplus profits" may be divided in the proportion of three-quarters to the consumers (in reduction of price), one-eighth to the stockholders, and one-eighth to the employee co-partners of the Company. The amount of the "surplus profits" is arrived at by calculating the sum by which the total amount payable by consumers during each year or half-year has been less than the amount which would have been payable if the gas had been charged for at the "basic" price. The sum so calculated is called the "consumers' share," and the amount of the "surplus profits" is a sum of which the "consumers' share" is three-quarters.

If the Company had paid the full dividend allowed by the provisions of the Act, the increase in price now made would involve a reduction of dividend. The actual dividends paid in recent years, however, have been considerably below those allowed by the Act. Under the Act, the Company would have been entitled to pay a dividend of 8·2 p.ct. on the ordinary stock for the year 1924; but the actual dividend paid was only 5¾ p.ct., a sum of £16,500 (equal to a further ¼ p.ct.) being allocated to the reserve fund, and £66,074 (equal to 1 p.ct. on the ordinary stock) to the co-partnership fund.

Under the Company's Act of 1920, the Council have a right, in the present session of Parliament, to ask for a revision of the "basic" price (at present 11d. a therm), and the necessary action is being taken accordingly. Any reduction in the "basic" price which may be obtained, however, will not necessarily affect the price which may be charged by the Company for gas, as this depends mainly (as explained above) on the cost of production and distribution. The effect of a reduction of the "basic" price will be to reduce the amount of the dividends which the Company would be *authorized* to pay, and the amount of the bonus which may be awarded to the employee co-partners of the Company.

NORTHAMPTON GAS ORDER.

Mr. H. C. Honey (Director of Gas Administration at the Board of Trade) inquired into the application of the Northampton Gas Light Company for a Special Order under section 10 of the Gas Regulation Act, on Monday, March 30, at the offices of the Board. The purpose of the Order is to extend the area of supply of the Company to include a large number of parishes in Northamptonshire.

Objections by the London, Midland, and Scottish Railway Company, the Grand Junction Canal Company, and the Weedon Gas Light, Coke, and Coal Company, Ltd., were met by the insertion of protection clauses; and the only objection remaining to be dealt with at the inquiry was that of the Northamptonshire County Council, who asked for protection beyond that afforded by general legislation with regard to roads and bridges, on the ground that the general legislation is out-of-date.

The Company were represented by Mr. S. E. Cash (Messrs. Vizard, Oldham, Crowder, & Cash, Parliamentary Agents); and the County Council by Mr. Parker (Messrs. Sharpe, Pritchard, & Co., Parliamentary Agents).

Mr. Cash dealt first with the clause releasing the Company from the obligation to supply gas from any main for other than lighting and domestic purposes, if the capacity of the main is insufficient. This was the subject of objection by the London, Midland, and Scottish Railway Company, who pointed out that the form of the clause is at present under discussion by the National Gas Council and the railway companies. As the Railway Company did not propose to attend the inquiry, he did not know whether they were relying upon the promoters not to insert the clause, or whether they were leaving it to the Board of Trade to decide whether to grant the clause or to let the matter stand over for the time being.

Mr. Honey said he had received a letter from the Railway Company to the effect that, as the promoters had agreed to wait until the clause had been settled between the National Gas Council and the railway companies, and then consider whether the clause should be inserted, it was not deemed necessary for them to be present.

Mr. Cash said he would prefer to drop the clause altogether, rather than wait for the agreement to be reached, because he gathered it would not be decided for some time.

Mr. Honey said he hoped that was not the case, because the matter had gone on long enough.

Mr. Cash, dealing with the objection of the County Council, said it was stated that the existing Acts and Orders of the Gas Company incorporated the provisions of the Gas-Works Clauses Acts, 1847 and 1871; but the provisions of those Acts, and of the existing Acts and Orders, were not sufficient for the protection of the County Council. At the time the Gas-Works Clauses Act, 1847, became law, the circumstances with regard to roads and traffic were very different from the circumstances prevailing to-day; and the provisions contained in the existing Acts and Orders were not suitable to meet the requirements of present-day traffic. It was submitted, therefore, that further provision should be made for the protection of the County Council in relation to main roads and county bridges and other works, both with regard to the existing area of supply of the Company (so far as it was within the county of Northampton) and the new area. Among other things, provision should be made for requiring works of the Company to be laid in suitable positions in roads and across bridges; for enlarging the period of notice under section 8 of the Gas-Works Clauses Act, 1847; for making further provisions as to the submission of plans for the approval of the County Council; for prohibiting interference with, or damage to, the structure of bridges; for saving the right of the County Council to widen, improve, or alter main roads and county bridges, and for relieving them from expense in connection with such widening, improvement, or alteration, arising out of the existence of pipes of the Company; for prohibiting the stopping of traffic in consequence of the operations of the Company; for requiring the Company to bear all costs due to congestion of traffic arising out of their operations; for exempting the County Council from liability in respect of damage or injury done to the works of the Company laid at an insufficient depth; and in other respects. Also, to refer differences to an arbitrator.

In their reply, the Company submitted that the provisions of the Gas-Works Clauses Acts, 1847 and 1871, which were incorporated in their existing Acts and Orders and in the proposed Order, had up to the present time been found to afford ample protection to the objectors, and that the circumstances with regard to roads and traffic had not materially altered since the passing of the Northampton Gas Act, 1919. The existing protection to county councils was afforded by general legislation; and they submitted that any change in the protection should be made by an alteration of the general law. It was also stated that the Company were informed that a meeting had been arranged to take place at an early date between the National Gas Council, in conjunction with other sub-surface users of roads, and the County Councils Association, with a view to discussing the question of the legal position of county councils as highways authorities; and they did not therefore propose to offer any further observations on the objections until after this meeting had been held.

Mr. Cash said the meeting referred to had not yet taken place; and he submitted that there was no reason why the Company should be asked to include special protection for the County Council in a matter which, after all, was governed by the general law. Although he was aware that the method of road construction had changed considerably, the provisions of the Gas-Works Clauses Act, 1847, broadly speaking, would seem to be sufficient. The question of road construction had been before Parliament on more than one occasion, and Parliament had not seen fit up to the present, by general legislation, to make any special provision with regard to mains and pipes. The Company were in Parliament as recently as 1919; but the County Council had not asked for protection then, and he did not think the Council could say that they were not then aware of the position in regard to road making. Broadly speaking, the kind of protection asked for by the Council in their objections had been declined by Committees of both Houses of Parliament from time to time in a number of Bills; but, of course, there were Bills in which certain clauses appeared. The great majority of these clauses, however, had been inserted by agreement, and had not been imposed on the promoters by Parliament. He understood that an electric lighting authority in the neighbourhood of Northampton had recently obtained an Order with regard to their undertaking, and that the County Council had not asked for similar protection against them. It was somewhat important, therefore, seeing that the Company were always in competition with electric lighting, that they should not have a burden cast upon them. Further, he believed it was an unknown thing for a clause of this kind to be imposed in respect of an existing area of supply on an application only for an additional area.

Colonel *G. S. Eunson* (Engineer and Manager to the Company) gave details as to the area to be added to the existing limits of supply.

Mr. Honey intimated that he would insert the usual clause to provide that, if the Company failed to supply within five years, their powers might be transferred. The Board of Trade did not want the Company to put a sort of "dead hand" on any of these parishes, so as not to supply themselves, and not to let anyone else do it.

Cross-examined by Mr. Parker, witness said he had always been on very friendly terms with the Surveyor to the County Council, and there had been no difficulty hitherto with regard to mains. He agreed that there might be difficulties in the future, if the Surveyor to the County Council, or his successor, were unreasonable. Asked if it would not be cheaper to settle differences that might arise by reference to an arbitrator, instead of to the Justices (reference to the Justices is provided by the Gas-Works Clauses Act), witness said he did not know how that would work out. *Prima facie* he saw no objection to going to arbitration.

Mr. Parker, referring to the statement that the County Council had not put forward clauses for their protection in 1919, explained that at that time the Council were very short-handed.

As to the period of notice to be given by the Gas Company to the County Council before carrying out works on county roads, witness said that the notice required by the Gas-Works Clauses Act was three days; and he agreed that this was rather short. He did, in fact, give the Council two or three weeks' notice; and when it was suggested that the County Council were moderate in asking for ten days, he replied that he did not think there was anything in this point. He agreed it was reasonable that the Company should be required to submit plans within seven days. As to county bridges, when requiring to carry a main over a bridge he always discussed the matter with the County Surveyor, and did not want to go through the actual structure of the bridges. It was not unreasonable to ask that the Company should not interfere with the structural part of the bridge without the consent of the Surveyor; it being provided that the Surveyor's consent should not be unreasonably withheld.

Replying to further questions, he said the Company should not be required to bear the expense of moving or deepening mains as the result of road widenings. Whether or not it was necessary to deepen a main, depended upon the circumstances. He had put mains at a certain depth at the request of the County Council; and he considered that, once a main was put in at a certain depth at the request of the Council, the Company's liability should cease. After a number of further questions had been put to him, he agreed that it would be of benefit to the Company if a main were removed to a position in which it would not be damaged when widening a road, assuming the question of cost did not arise.

Asked if it would not be reasonable that the County Council should be in the position to take the Company to arbitration if the Company wanted to stop-up the whole of a road, and for the arbitrator to decide whether it was in fact necessary to stop-up the whole road, he said that the possibility of the Company's wanting to stop-up a road wholly would be so remote that there would be no necessity for arbitration. He also maintained that damage to mains caused by steam-rollers operated by the County Council was a matter for which the Council should be responsible.

Mr. Parker then pointed out that general legislation in regard to gas mains was enacted in 1847, whereas that relating to electricity was enacted in 1899; so that the latter was more up-to-date than the former.

Witness replied that the Company did not mind restrictions, provided they applied to all sub-surface users of roads.

Mr. Parker then disputed Mr. Cash's statement that Parliament had declined to give such protection as the County Council were asking for, and said that for the most part decisions of Parliament had been in favour of this protection. Having ascertained from witness that he did not want the passage of the Order delayed, he asked, supposing the meeting between the National Gas Council and the County Councils Association agreed that, to some extent, the protection now asked for was reasonable, and the Order had already been approved, what would be the position of the County Council. Seeing that the Company did not agree to give to the County Council what witness had admitted was reasonable, would he agree to hold-up the Order?

Witness said it must be held-up, but this would inconvenience the people who wanted gas.

Re-examined by Mr. Cash, witness agreed that, if the Company now gave the County Council the protection they asked for, and it was ultimately decided that what they asked for was unreasonable, or that some lesser protection should be given, the Company would be in a worse position than any other public utility company.

Mr. Honey said he believed the view of the Board of Trade would be that they had had enough experience of holding-up Orders pending agreements by outside bodies, and that they must go on with the Order. If they were to wait for an agreement between outside bodies, the Order might drag on for another two years.

Witness, in answer to further questions in re-examination, said it did not matter very much whether general legislation with regard to gas and electricity mains was enacted in 1847 or 1899, because the necessity for the present methods of road construction had not arisen even in 1899. There was no heavy motor traffic then. He preferred to go to the Justices for the settlement of differences, rather than to arbitration, from the point of view of expense.

This concluded the case for the Order.

Mr. Parker, addressing Mr. Honey, said he had a clause which

he would like to submit, without prejudice. He did not wish to be tied to the terms of this clause.

Mr. Honey said in that case he did not want to see it. He could not take a clause submitted to him without prejudice, but would consider the clause required by the County Council.

Mr. Parker said that, if the Board of Trade would give a decision as an opposed matter on his clause, he was content; but the practice of the Board had always been that they would not decide these clause matters, and if there were no agreement between the promoters and the objectors they would not insert a clause in an Order. Therefore the position was that if the Company would not accept a clause, it was useless for him to fight for it at that inquiry, and he must take other steps to secure it. In previous cases the Board had strongly recommended the promoters to try to effect an agreement with the objectors; and he suggested that Mr. Honey might use his good offices in this case, and try to persuade the Company to accept the provisions which their only witness had agreed were reasonable. In the absence of agreement with the Company, and in the absence of Mr. Honey using his good offices to influence them to come to an agreement, he could do nothing. The County Council had no objection to the Order, in principle, subject to reasonable protection, which had been agreed to or given by Parliament in hundreds of cases. While the Company and the Council were very good friends at present, they might not always remain so; and it seemed that the best thing to do would be to arrive at a simple way of disposing of differences that might arise—namely, by arbitration. He suggested holding-up the Order for a short period, to give the parties a chance of coming to an agreement.

Some discussion then took place as to the difference between the legislation relating to gas and electricity mains.

Mr. Parker, in reply to Mr. Honey, said that the Electric Lighting (Clauses) Act, 1899, incorporated the Gas-Works Clauses Act, 1847, but superimposed other conditions. Asked how the Electric Lighting (Clauses) Act added to the provisions of the Gas-Works Clauses Act, he said he was informed that, among other things, it provided for a month's notice instead of the shorter period of three days.

Mr. Cash read an extract on the subject from the sixth edition of Michael and Will's "Gas and Water," and said he did not see any very material difference.

Mr. Honey said the case the County Council had made out was not a case for dealing with this matter in anticipation of general legislation, because their case was that, so long as they had a reasonable surveyor, and so long as the Company's officials were reasonable, they had no difficulty.

Mr. Parker said he had not put it quite so high as that. He had said that there had been no difficulty in the past, but there was no guarantee that there would not be in the future. Reasonable men sometimes fell out. His position was that it was necessary to deal with this matter here and now; otherwise they could never impose these conditions on the Company with regard to the powers it was proposed to give them under this Order.

Mr. Honey said the general view of the Board of Trade on these clauses was that, in the absence of agreement, they would not make any alteration of the general law which ought to apply to all classes of undertakers who had power to break-up roads. The County Council were asking the Board to make an alteration in the general law applicable to a single undertaking, and to put them under different statutory conditions from any other undertaking of the same kind in the county, and any other undertaking of a different class—such as electricity or water—in the county. This the Board of Trade were not prepared to do. If it could be shown that there was a case as regards this individual Company for special treatment, it was open for the County Council to do so, and the point would be considered; but they must not ask the Board to do, in respect of an individual undertaking, what ought to be done, if at all, by general legislation applicable to all undertakings.

Mr. Parker thought it would be found, if the matter were gone into, that the majority of undertakings in the county had similar provisions to those now asked in relation to the road authorities.

Mr. Honey said that all the County Council had done was to say the existing law was insufficient, and that they wanted better protection; but when they were asked what protection they wanted, they would not tell him. They were asking for an undefined alteration of the general law.

Mr. Parker said he did not attempt to differentiate the County Council from any other county council in relation to any other gas undertaking; and he did not say he had a special case in relation to this Company. His contention was that the Act of 1847 was not good enough for to-day; and this position had been recognized by, he believed, every gas company he had come across until this one. It did not seem to him to be of any use going into the details of his clause at the inquiry, because he frankly confessed that his case was not a peculiar one to this Company. The position taken up by the Board of Trade made it necessary for the County Council, if they could not agree with the Company, and if the Board of Trade could not persuade the Company to meet them further, to reserve their opposition for another place.

Mr. Honey pointed out that the County Council's objection did not comply with the provisions of the Gas Regulation Act, inasmuch as it did not state precisely the additions or modifications of the Order asked for.

Mr. Parker intimated that he would agree to be tied to the clause he had referred to previously, if Mr. Honey were prepared to go into it in detail.

Mr. Honey said he did not think he could re-open the matter; it meant starting the inquiry all over again.

Messrs. Ashmore, Benson, Pease, & Co., Ltd., of Parkfield Works, Stockton-on-Tees, have secured a contract for the construction and erection of a large gasholder for the Metropolitan Gas Company of Melbourne, Australia.

At the annual meeting of the Wellington (N.Z.) Gas Company, Ltd., the Chairman (Sir Harold Beauchamp) mentioned that a contract for a gasholder of a capacity of 2 million c.ft. had been placed with Messrs. R. & J. Dempster, Ltd., of Manchester.

INAUGURATION OF COAL-HANDLING PLANT AT NEW MILLS.

Gas engineers from various parts of the country attended the official opening, on March 28, of the retort charging and coal handling plant which, at a cost of £2000, has been installed at the gas-works of the New Mills Urban District Council. The advantages of the machine were explained by Mr. Herbert Spriggs, of Messrs. Herbert Morris, Ltd., of Loughborough, who have installed the plant. Following the inspection, the firm entertained the guests to luncheon at the Town Hall. Councillor Harry Yates (Chairman of the Gas Committee) presided, and was supported by members of the Council.

The Chairman, responding to the toast "Success to the Gas Undertaking," said that during the last few years no small amount of work had been done, though much remained still to be done. They had converted two beds of seven retorts from generator fired and luted lids to regenerator fired with self-sealing mouthpieces, and in addition had taken out a bed of five retorts (direct-fired), replacing them with a bed of seven retorts. They had also replaced an 8-in. cast-iron foul main by a 14-in. steel main, had installed a new Cornish boiler, replaced an exhauster of 8000 c.ft. per hour by one capable of dealing with 30,000 c.ft., repaired the purifiers, and, among other things, installed a 20-ton weighbridge. Extensions contemplated, at an estimated cost of £17,000, included a gasholder of 250,000 c.ft. capacity, four purifiers, washer, scrubber, and a station meter.

Mr. Spriggs, on behalf of Messrs. Herbert Morris, Ltd., presented to the Chairman, as a memento of the occasion, a silver bowl, on which was inscribed: "Presented to Councillor Harry Yates by Messrs. Herbert Morris, Ltd., Loughborough, on the occasion of the opening of the retort charging and coal handling plant, Gas-Works, New Mills, March 28, 1925."

Councillor R. Bradley (Vice-Chairman of the Gas Committee), proposing the toast "The Contractors," paid a high tribute to the firm of Messrs. Herbert Morris.

Mr. Spriggs, responding, spoke of the advantages of the new plant, which, he said, would be cumulative. In a reference to the Council's Engineer, Mr. J. S. Brown, he said they had a man of the right engineering capacity and the right energy.

TRADE NOTES.

"Renrut" Specialities.

Messrs. David Grant & Co., of East Crosscauseway, Edinburgh, have been appointed sole Scottish agents for "Renrut" patent high-pressure service cleansers, syphon pumps, &c., under arrangement with Messrs. Abbot, Birks, & Co., of No. 113, Newington Causeway, London, S.E., who are sole concessionaires.

New Plant for Belfast.

On the recommendation of the Gas Engineer (Mr. J. D. Smith), the Belfast Corporation have accepted the following tenders: Three vertical water-cooled condensers, Messrs. R. & J. Dempster, Ltd.; two Livesey washers, the Whessoe Foundry and Engineering Company, Ltd.; two horizontal scrubber-washers, the Whessoe Foundry and Engineering Company, Ltd.; and three 250,000 c.ft. per hour exhausters, Messrs. Geo. Waller & Sons.

CONTRACTS OPEN.

Vertical Retort Bricks, &c.

The Corporation of Glasgow are inviting tenders for the supply of vertical retort bricks, spurs, and tiles. [See advert. on p. 138.]

EXTENSIONS.

New Plant for Burnley.

The Burnley Town Council have adopted the recommendation that the Town Clerk, Gas Engineer, and Borough Surveyor shall take the necessary steps to prepare and submit as soon as possible a complete scheme for the erection of the first unit of the new gas-works at Old Hall to the Unemployment Grants Committee of the Ministry of Health.

New Plant for Blackburn.

On April 2 the Blackburn Town Council decided to embark on schemes for the relief of unemployment, including the erection of a holder at the Greenbank Works, and the provision of oil gas plant.

Blyth Gas Company.

The Company have in view important extension schemes. These include the erection of a 300,000 c.ft. holder at the Bedlington Works and a water condenser to deal with one million c.ft. of gas per day at the Blyth Works.

Coventry Gas-Works.

The Coventry Gas Committee recommend the City Council to approve of the second section of the scheme of extension at the gas-works at Foleshill being proceeded with at an estimated cost of £266,310, and that application be made to the Board of Trade for a Special Order under the Gas Regulation Act authorizing the borrowing of £350,000 for this purpose, and for the purpose of mains. The total scheme, which involves an estimated cost of £425,000, was originally approved in 1919, when it was decided to carry out the work of extending the plant at the gas-works in two sections. The work which it is now proposed to proceed with includes the installation of vertical retorts of 2½ million c.ft. capacity per diem, at a cost of £96,000, and a 5 million c.ft. holder, at a cost of £90,000. In addition, it is proposed to extend the railway sidings at the works at an estimated cost of £18,500.

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

Apart from an increased demand for prompt shipments of Northumberland steam coals, which is of little interest to gas coal consumers, the market was again featureless in the past week. There are very few signs generally of the usual rush to fill requirements before the holiday, and shippers have no anxiety about finding ample supplies to get their boats away.

Gas coal trade is no brisker, and, while the better sorts still manage to maintain fairly good prices, much more trade could be dealt with.

Wear Special makes indicate 20s. 6d. f.o.b., and best qualities 10s. 6d. to 20s. Seconds and others are 17s. to 17s. 3d., with considerable competition even at these prices.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

Some of the gas-works managements are beginning to sound the market with regard to new annual contracts from midsummer. Collieries have been invited to state their terms on the assumption that they will be willing to make substantial concessions if they can assure themselves of outlets for any considerable proportion of their potential production. Reductions of 2s. to 3s. on current contract rates are looked for, though some of the consuming interests put the depreciation at a higher figure. Unless the position undergoes some unforeseen change between now and June, contracts will be on a smaller scale than those made last year, when recent difficulties with regard to deliveries led engineers to seek an unusually ample margin of safety. Consumptive demand having fallen short of calculations, there is every likelihood of considerable balances being carried over from the current contracts into the new period. These balances will modify any savings which gas undertakings may effect by the bargaining which has now begun. Conditions in the coalfields show no improvement. The outlook is so uncertain that many collieries cannot see their way to make ends meet on a lowered earning capacity. However it may be with the newer pits, which, from their natural advantages and modern equipment can get coal economically, the prospect is menacing for many properties.

There are signs of slackening in the active demand that has ruled for a long time past in the best grades of house coal; individual collieries notifying a reduction of 2s.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

Gas coals under contract in Yorkshire and Lancashire are easy, and it is anticipated that there will be some concession in regard to renewals during the next two or three months.

House coals remain steady, with indications of slightly reduced figures after Easter.

Industries are still quiet, with little business available for the lower-grade fuels at discounted prices.

Export remains dull; but there are indications of a slight recovery, orders at low figures being on the market at the present time.

At Hull at the week-end Humber bunker and export prices (f.o.b. usual shipping ports) were: South Yorkshire: Hards, Association, 19s. 3d.; screened gas coal, 19s. 6d.; washed trebles, 20s. 6d.; washed doubles, 17s. to 17s. 6d.; washed singles, 17s.; washed smalls, 13s. to 13s. 3d.; unwashed doubles, 15s. 9d. to 16s. 3d.; rough slack, 11s. to 11s. 6d.; smithy peas, 20s. to 21s. West Yorkshire: Hartleys, 17s. to 19s.; screened gas coal, 19s.; washed trebles, 17s. 6d. to 18s. 6d.; washed doubles, 16s. to 17s.; washed singles, 16s.; washed smalls, 12s. 6d. to 13s.; unwashed trebles, 18s.; unwashed doubles, 13s. 6d.; rough slack, 11s.; coking smalls, 10s. 3d. to 10s. 9d. Derbyshire and Nottinghamshire: Top hards, 19s.; washed trebles, 18s.; washed doubles, 17s. 6d. to 18s.; washed singles, 17s.; washed smalls, 12s. 9d.; unwashed doubles, 15s.; rough slack, 10s. 6d. to 11s. Yorkshire, Derbyshire, and Nottinghamshire: Screened steam coal, 15s. 3d. to 18s.; gas coke, 21s. to 23s.; furnace coke, 17s. 3d. to 18s. 6d.

In Lancashire, best qualities of slack are in good demand at prices ranging up to 16s. 6d. per ton, but common slacks are weak.

Gas Cookers for Stoke.—The Stoke-on-Trent Corporation Gas Committee are seeking sanction to a loan of £10,000 for the purchase of gas cookers.

Southend Gas Company.—It was stated in the report adopted at the annual meeting of the Company that the consumption of gas last year was 10 p.ct. more than in 1923, and that, in spite of considerable recent expenditure—a new holder, purifiers, &c., having been installed—the capital per million c.ft. of accounted-for gas was a satisfactory feature, and suggested that the Company occupied a strong position. The Chairman (Mr. J. H. Burrows, J.P., C.A.) pointed out that the gas sales last year reached nearly 902 million c.ft., and that the 10 p.ct. increase then recorded followed upon an increase of 17½ p.ct. for 1923. Ten years ago the sale of gas did not reach 440 million c.ft. "I am," remarked the Chairman, "greatly indebted to Mr. J. T. Randall, your Secretary, of whom it may be said 'Ever faithful, ever true.' I am also similarly indebted to Mr. T. F. Canning, a man who has overcome substantial difficulties, and of whom we can assert that each successive year's experience contributes additional justification of our choice of him from a short list of strong applicants." Dividends were declared on the original consolidated and new ordinary stocks at the rate of 6⅜ p.ct. per annum, on the new ordinary "B" stock 5¾ p.ct., and on the redeemable preference stock 7 p.ct., less income-tax.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *April* 6.

A little more business is offering in the London tar products market in pitch, and the price is firm at about 42s. per ton in bulk at makers' works.

Creosote is rather quiet at about 7¼d. per gallon net and naked at works.

Solvent naphtha 95/160 is quite firm at about 1s. 8d. per gallon; other spirits remaining unchanged.

Tar Products in the Provinces.

April 6.

The markets for tar products are unaltered.

Pitch is still very dull, and even the low prices quoted to-day do not induce manufacturers on the Continent to purchase. They might possibly be interested in some quantity for next season at to-day's prices, but quite naturally the manufacturers feel the market is so low that they can do no harm by waiting.

Creosote is unaltered. There is a fair home demand, and a renewed inquiry for export is looked for at an early date.

Benzole is a little easier, doubtless due to the disappointment that an advance has not taken place in the price of petrol.

Solvent naphtha is steady, and the majority of manufacturers are well sold. Heavy naphtha is dull and difficult to sell.

Carbolic and cresylic are entirely neglected.

Naphthalene is almost unsaleable.

The average values for gas-works products during last week were: Gas-works coal tar, 29s. 3d. to 34s. 3d. Pitch, East Coast, 40s. to 41s. f.o.b. West Coast—Manchester, 35s. to 36s.; Liverpool, 36s. to 37s.; Clyde, 39s. to 40s. Benzole, 90 p.ct., North, 1s. 6½d. to 1s. 7¾d.; crude, 65 p.ct., at 120° C., 9¼d. to 10¼d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 1d. to 1s. 2d. Toluole, naked, North, 1s. 7½d. to 1s. 8¾d., nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8d. Solvent naphtha, naked, North, 1s. 5d. to 1s. 6d. Heavy naphtha, North, 1s. 1d. to 1s. 2d. Creosote, in bulk, North, liquid, 6¼d. to 6¾d.; salty, 6¼d. to 6¾d.; Scotland, 6d. to 6¾d. Heavy oils, in bulk, North, 6⅝d. to 7d. Carbolic acid, 1s. 6d. to 1s. 7d. prompt. Naphthalene, £12 to £15; salts, £4 to £5, bags included. Anthracene, "A" quality 3d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Exhibition at Brighouse.

Great interest was taken in an exhibition which was organized by the Gas Department of the Brighouse Corporation, and held from March 2 to 7. All types of cookers were on view, including the Standard Cooker of the National Gas Council (exhibited by the Parkinson Stove Company, Ltd.), which is supplied on simple-hire terms by the Brighouse Gas Department. Among other cookers were the "New World" and "New World Junior," of Radiation Ltd., and the "Chef" cooker by Messrs. William Sugg. As to fires, these were well represented by the "Cosie" of the Parkinson Stove Company, the "Cinderella" of Messrs. R. & A. Main, Ltd., and a number of excellent examples manufactured by the Cannon Iron Foundries, Ltd. An interesting exhibit was that of the Gas Department in collaboration with a local firm, which was a successful attempt to show a first-class bathroom fitted with geyser, heated towel-rail, and a novel shaving fitting. A portion of the exhibit was devoted to coke, and samples of various grades were shown. Excellent results were the outcome of the week's publicity—results which reflect great credit on Mr. C. R. Ingham, the Engineer and Manager. The value of the sales was approximately £1000, which is about the normal annual sale of appliances by the Department. The great value of the exhibition, however, lies not in the actual sale of appliances, nor in the increased consumption through these new appliances, but in the increased consumption through existing apparatus, as the result of the educational work.

Dundee Gas-Works.—At a recent meeting of the Dundee Gas Committee it was reported that tenders for 100,000 tons of coal had been accepted at an average price of 21s. 6d. per ton—a drop of 5s. 6d. per ton on last year's purchases. A report by Mr. James Dickson, the Gas Manager, was read. In this he states that the storage capacity is now 4¼ million c.ft., and the maximum daily output 7¼ millions. The ratio of storage capacity to daily output is, he considers, low. With regard to the maintenance of gas appliances, he recommended a systematic visitation, and estimated that sixteen men, working on eight districts, could cover the city, and pay at least two visits per annum to each consumer.

Londonderry Gas Light Company.—Some trenchant criticisms of the Electricity Department of the Londonderry Corporation were passed by Mr. R. H. Smyth (Chairman) at the annual meeting of the Gas Company. It was now three months, he said, since they drew attention to the pamphlet issued by the Electricity Department in which it was stated that under their so-called "free wiring scheme" electricity was the most economical form of illumination. The Gas Company stated the actual facts—viz., that, so far from being the most economical illuminant, electricity, under this scheme, was actually 100 p.ct. dearer than gas. In justice to themselves they could not let the statement regarding the cost of the respective illuminants go unchallenged, but a more serious question was involved from the ratepayers' point of view, as to which the Company, as one of the largest ratepayers in the city, had a right to protest. To inaugurate the scheme, many thousands of pounds of the ratepayers' money was to be spent in laying cables, supplying expensive prepayment meters, wiring, and fitting in the smaller houses in the city. When the householder found that his lighting expenditure was increased, he would revert to gas. In another portion of his speech Mr. Smyth mentioned that 250 consumers had been added during the year. Reduction in prices represented £8000, or 17 p.ct. less than last year, which had been balanced by reduced expenditure. The new manufacturing plant had been completed, and was giving entire satisfaction. New mains and replacements would shortly be completed.

STOCK MARKET REPORT.

The financial crisis in France dominated the situation on the Stock Exchange last week. The rumour early in the week that the note circulation was to be increased was dissipated by M. Herriot's denial, which was followed by the resignation of the old and the appointment of the new Minister of Finance. At the moment it is impossible to say what effect the change will have on the financial policy of France. There was, however, a fair amount of selling of French Rentes and railway sterling bonds. The success of the Conversion Loan should be very gratifying to the taxpayer, as the annual saving of about £100,000 indicates a possibility of a still greater relief in the future, although perhaps not in the immediate future.

On the whole, the week closed more cheerfully, and the general tone was steady, although business was on a small scale. The Industrial and Miscellaneous Markets were rather subdued, and the Gas Market depression continued. There was renewed interest in the Newspaper group; Allied Newspapers and Daily Mirrors being prominent. Breweries were in demand, and there was a big jump of 55 points in Guinness to 610. Tobaccos also were well supported; Imperials, on rumours of another bonus, and Carreras on the remarkable expansion of business, were both marked up.

Brentford "A" and "B" stocks dropped another 3 points to 100-105; Commercial 4 p.ct. and 3½ p.ct. stocks 1 point and 2 points respectively. Dividend proximity accounted for the further rise of 1 point in Imperial Continental ordinary.

The following transactions were recorded during the week:—

On Monday, Aldershot "C" 79, Alliance and Dublin 70⅜, Bournemouth "B" 12⅜, Continental Union 7 p.ct. preference 91, European 7¼, 7⅜, Gas Light and Coke 89¼, 89½, 89⅜, 3½ p.ct. maximum 63½, Imperial Continental 181, 181½, Primitiva 8s. 4½d., 8s. 10¼d., South Metropolitan 94½, 94⅜, 95, Tottenham "B" 99½, 100. Supplementary prices, Brentford 6 p.ct. mortgages 98½, Cheltenham 5 p.ct. maximum 78¾, 4½ p.ct. debenture 61, Gloucester consolidated 89¼, 89⅜.

On Tuesday, Alliance and Dublin 69, Bombay 5¼, Brentford "A" 100, British 113½ *ex* div., Gas Light and Coke 88½, 89, 89½, 89⅛, 3½ p.ct. maximum 64, 4 p.ct. preference 79½, 79½, 3 p.ct. debenture 60½, Imperial Continental 179, 180½, 181, Ottoman 5s., Primitiva 8s. 9d., South Metropolitan 94½, 95, 3 p.ct. debenture 59½, 60½, 61½, Tottenham "B" 98.

On Wednesday, Alliance and Dublin 69, 69⅜, 69⅜, British 113 *ex* div., Commercial 3 p.ct. debenture 58, European 7⅜, 7½, Gas Light and Coke 88½, 88⅞, 89¼, Imperial Continental 181, Liverpool 7 p.ct. preference 105½ *ex* div., Primitiva 8s. 9d., 4 p.ct. 1st debentures 80¾, San Paulo 6 p.ct. preference 77½, 77⅝. South Metropolitan 94½, 95, 3 p.ct. debenture 61¼, Southampton 84, 84½. Supplementary prices, Hartlepool 5 p.ct. maximum 89⅜, Uxbridge Maidenhead 4 p.ct. debenture 75, 75⅛.

On Thursday, Aldershot "C" 79½, British 112, 113, Gas Light and Coke 89¼, 89⅜, 3½ p.ct. maximum 63, 4 p.ct. preference 79½, Imperial Continental 181, 182, Montevideo 65½, 65¾, South Metropolitan 95⅛, 95¼. Supplementary prices, Dover 5¼ p.ct. debenture 102½.

On Friday, Alliance and Dublin 4 p.ct. debenture 66, 66½, Bombay 5⅛, Bournemouth "B" 12⅜, Continental Union 37, Gas Light and Coke 89, 89⅛, 3½ p.ct. maximum 63, 4 p.ct. preference 79½, 3 p.ct. debenture 60, Imperial Continental 180½, 181, 181½, 182, Liverpool 7 p.ct. preference 104⅜, 105⅛. Primitiva 8s. 6d., 8s. 11¼d., South Metropolitan 94⅜, 95, 95⅛, South Suburban 5 p.ct. 99, 101, Tottenham "B" 99, 100. Supplementary prices, Aldershot 7 p.ct. bonds 105⅜.

Extremely easy conditions existed in the Money Market at the close of the week. Old day-to-day loans were continued at 3½ p.ct., while fresh money was available at 3 p.ct. Discount quotations remained weak in tendency, but the average rate at which Treasury Bills were allotted—£4 5s. 7·15d. p.ct.—had a hardening influence.

The feature of the Foreign Exchange Market was the erratic movement in the French franc in consequence of the Government's financial position. The Paris cheque closed on Friday at 92.55; but on Saturday the rumours of restorative measures to be introduced in the Chamber had a salutary effect, and the rate moved in favour of France to 91.85. Sterling was quiet but firm at 4.78¼. Belgian francs closed at 94.05, and Italian lire at 116⅞ on Saturday.

Silver was quiet, and the price remained at 31 7/16d. per oz. Gold was also unchanged at 86s. 6d. per oz.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on March 5. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3¼ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Apl. 3.	Rise + or Fall − on Week.	Transaction Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 5	5	5	Aldershot 5 p.c. max. C. .	78—81	..	79—79½
295,492	,,	,,	4	4	Do. 4 p.c. Pref. . .	71—76	..	..
1,551,868	,,	Apl. 2	6½	6½	Alliance & Dublin Ord. .	65—70*	..	£9—70⅜
374,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb. . .	63—68	+2	66—66½
300,000	5	Oct. 23	8	8	Bombay, Ltd.	5—5¼	..	5⅛—5⅛
100,000	10	Mar. 5	8½	8½	Bournemouth 5 p.c. . .	12—13	..	..
425,050	10	,,	7	7	Do. B 7 p.c.. .	12½—12¾	..	12⅜—12⅜
150,000	Stk.	Jan. 8	3	3	Do. Pref. 6 p.c..	10⅜—11½	..	..
50,000	Stk.	,,	4	4	Do. 3 p.c. Deb..	56—59	..	..
£762,025	,,	,,	4	4	Do. 4 p.c. Deb..	76—79	..	..
992,045	,,	Mar. 5	6⅞	6¾	Brentford A Con. . . .	100—105	−3	100
990,500	,,	,,	5	5	Do. B New . . .	100—105	−3	..
76,000	,,	,,	5	5	Do. 5 p.c. Pref. . .	95—98	..	..
306,690	,,	Dec. 18	4	4	Do. 4 p.c. Deb. . .	76—81	..	..
181,337	,,	,,	6	6	Do. 6 p.c. Rich. Red. Deb.	100—105	..	..
214,740	,,	Mar. 5	11½	12½	Brighton & Hove Orig. .	165—170	..	..
244,200	,,	,,	8½	9½	Do. A Ord. . . .	122—125	..	..
1,287,500	,,	Feb. 19	4	5	Bristol 5 p.c. max.. . .	96½—97¼*a*	..	112—113½
855,000	,,	Mar. 19	8	7	British Ord.	112—113*	..	..
100,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref.. .	123—128	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb..	72—77	..	..
100,000	10	Dec. 18	8	6	Cape Town, Ltd. . . .	7—8	..	..
100,000	10	Nov. 6	4½	4½	Do. 4½ p.c. Pref.. .	6—7	..	..
100,000	Stk.	Dec. 18	4½	4½	Do. 4½ p.c. Deb.. .	71—76	..	..
150,000	,,	Feb. 19	6	6	Cardiff Con. Ord. . . .	101—104	..	..
626,860	,,	Jan. 8	7½	7½	Do. 7½ p.c. Red. Deb..	104—107	..	..
237,860	,,	Feb. 19	5	5	Chester 5 p.c. Ord. . . .	89½—94½*b*	..	..
157,150	,,	Mar. 5	6	5/14/8	Commercial 4 p.c. Cap. .	90—93	−1	..
2,513,280	,,	,,	6	5⅞	Do. 3½ p.c. Cap. .	89—92	−1	..
560,000	,,	,,			Do. 3 p.c. Deb. .	57—60	..	58
475,000	,,	Dec. 18	3	3	Continental Union, Ltd. .	37—42	..	37
800,000	,,	14 Jan. 15	—	—	Do. 7 p.c. Pref. .	88—92	..	91
200,000	,,	Dec. 18	7	7	Croydon sliding scale . .	100—103	..	..
660,000	,,	Mar. 5	6½	6½	Do. max. div. . . .	83—86	..	..
284,975	,,	,,	5	5	Derby Con.	110—112*c*	..	..
492,270	,,	Feb. 19	6	9	Do. Deb.	74—76*c*	..	..
55,000	,,	Jan. 8	4	4	European, Ltd.	7—8	..	7⅜—7⅝
2,002,180	I	Jan. 22	6	4	Gas Light & Coke 4 p.c. Ord.	88½—90½	..	88⅜—89⅝
3,460,070	Stk	Feb. 19	5⅜	5⅜	Do. 3½ p.c. max. .	62—65	..	63—64
1,600,000	,,	,,	3½	3½	Do. 4 p.c. Con. Pref.	78—80	..	79⅛—79½
1,062,235	,,	,,	4	4	Do. 3 p.c. Con. Deb.	59—62	..	60—60⅛
1,761,930	,,	Dec. 18	3	3	Do. 10 p.c. Bonds . .	..	..	—
130,000	,,	—	10	10	Do. 7½ p.c. Irred. Deb.	..	..	..
42,000	,,	—	7½	7½	Hastings & St. L. 5 p.c. Conv.	92—97*	..	..
82,500	,,	Mar. 19	6¾	6¾	Do. 3½ p.c. Conv.	73—78*	..	..
258,740	,,	,,	5⅛	5⅛	Hongkong & China, Ltd. .	16—17	..	..
70,000	10	Sept. 25	10	10	Hornsey 7 p.c.	138—143	..	..
86,600	Stk.	Mar. 5	10	10	Imperial Continental Gas. .	179—184	+1	179—182
1,976,000	,,	Nov. 20	30	10	Do. 3½ p.c. Red. Deb.	71—74	..	..
263,950	,,	Feb. 5	3½	3½	Lea Bridge 5 p.c. Ord.. .	96—101*	..	..
235,242	,,	Mar. 19	6¾	6¾	Liverpool 5 p.c. Ord. . .	87½—88½*b*	..	..
1,727,340	,,	Feb. 19	5⅛	5⅛	Do. 7 p.c. Red. Pref.	101—103*b*	..	104⅜—105⅛
600,000	,,	Mar. 19	7	7	Maidstone 5 p.c. Cap. . .	125—132	..	..
165,736	,,	Feb. 19	9	8	Do. 3 p.c. Deb. . .	54—59	..	..
63,480	,,	Dec. 18	3	3	Malta & Mediterranean .	4—4½	..	..
75,000	5	Dec. 4	4	4	Montevideo, Ltd. . . .	62—67	..	65⅛—65⅝
541,920	Stk.	Nov. 20	4	4	Newcastle & Gateshead Con.	80—81*d*	−1	..
1,061,315	,,	Mar. 5	5	5	Do. 4 p.c. Pref..	72⅜—73¼*d*	..	..
300,929	,,	,,	4	4	Do. 3½ p.c. Deb.	68—69*d*	..	..
529,705	,,	Dec. 18	3½	3½	North Middlesex 10 p.c. .	..	..	..
15,000	10	Mar. 5	11	12	Do. 7 p.c. .	..	..	..
75,940	10	,,	7⅞	8⅝	Oriental, Ltd.	102—107	..	..
300,000	Stk.	Dec. 4	7	9	Plym'th & Ston'house 5 p.c.	109—114	..	..
188,120	,,	Jan. 8	7⅛	7⅛	Portsea Island B . . .	96—99	..	..
60,000	50	Mar. 5	13	14	Do. C	93—98	..	..
100,000	50	,,	12	13	Primitiva Ord.	8/3—9/3	+/3	8/4½—8/11½
£289,900	I	—	—	—	Do. 4 p.c. Red. Deb.. .	79—81	..	80½
311,100	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb. 1911	63—65	..	..
600,000	Stk.	Jan. 22	4	4	Do. B. Aires 4 p.c. Rd. Db.	65—67	..	..
220,335	,,	Dec. 18	4	4	Do. R'y Pte 4 p.c. Rd. Db.	55—67	..	..
321,670	,,	,,	4	4	San Paulo 6 p.c. Pref. .	7⅞—8⅛	+⅛	7 25/32—7 29/32
150,000	10	Mar. 19	6	6	Do. 5 p.c. Red. Deb.	43—46	..	..
125,000	50	Jan. 2	5	5	Sheffield A	102—104*e*	−2	..
270,000	Stk.	Mar. 19	5½	5½	Do. B	102—104*e*	−2	..
419,968	,,	,,	5½	5½	Do. C	102—104*e*	−2	..
£1,047,000	,,	,,	5½	5½	South African	7—9	..	..
90,000	10	Oct. 23	8	6	South Met. Ord.. . . .	94—95	..	94⅛—95⅛
5,609,855	Stk.	Feb. 19	5	6½	Do. 3 p.c. Deb. . .	59—62	..	59⅛—61⅛
1,895,445	,,	Jan. 8	3	3	Do. 6½ p.c. Red. Deb.	102½—104½	..	..
734,000	,,	Mar. 5	6½	6½	South Shields Con. . . .	135—136*d*	..	..
91,500	,,	Mar. 5	8½	8½	South Suburban Ord. 5 p.c.	99—104	−1	99—101
£1,187,795	,,	Feb. 19	6½	6½	Do. 5 p.c. Deb.	97—100	..	..
368,837	,,	Dec. 18	5	5	South'mpt'n Ord. 5 p.c. max.	83—86	..	84—84½
647,740	,,	Nov. 6	5	5	Do. 6½ p.c. Red. Deb..	103—105	..	..
121,275	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	72—77	..	..
250,000	,,	Mar. 5	7	7	Swansea 7 p.c. Red. Pref. .	101—103	..	..
200,000	,,	Dec. 18	6½	6½	Do. 6½ p.c. Red. Deb..	103—105	..	..
120,000	,,	Feb. 19	8	8	Tottenham District A 5 p.c.	116—119	..	..
882,275	,,	,,	6½	6½	Do. B 3½ p.c.	98—101	+½	98—100
181,255	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	75—79	..	..
258,251	,,	Mar. 19	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, & Wycombe 5 p.c. . .	77—79*d*	..	..
197,294	,,	Feb. 19	6¾	6¾	Do. 5 p.c. pref. .	100—105	..	..
88,330	,,	,,	5	5	Do. 5 p.c. Maidenh'd	93—98	..	..
91,800	,,	,,	—	6½	Wandsworth, Wimbledon, and Epsom—	90—95	..	..
30,000	,,	Mar. 5	9½	9½	Wandsworth A 5 p.c. .	135—140	..	..
255,636	,,	,,	7⅞	7⅞	Do. B 3½ p.c.t. .	114—119	..	..
392,955	,,	,,	6/9/6	6/9/6	Do. C and New	97—102	..	..
359,000	,,	,,	7⅞	7⅞	Wimbledon 5 p.c.t. . .	109—114	..	..
98,000	,,	,,	7⅞	7¼	Epsom 5 p.c.t.. . . .	117—122	..	..
88,416	,,	Dec. 18	3	3	3 p.c. Deb.	57—60	..	..

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THE FLOW OF GASES and PROPORTIONING GAS MAINS.

By

F. SOUTHWELL CRIPPS, Assoc.M.Inst.C.E.

WALTER KING, Ltd., "Gas Journal" Offices, No. 11, Bolt Court, Fleet Street, E.C.4.

New Company.—The Geyser Manufacturing Company has been registered, with a capital of £1000.

Maryborough (Queensland) Gas and Coke Company, Ltd.—The Directors' report for the half-year ended Dec. 31, 1924, showed a profit of £1943. Out of this the Directors recommended the payment of the usual dividend of 6 p.ct. per annum, together with a bonus of 1 p.ct.

Wandsworth Gas Company's Price Increase.—The Directors of the Wandsworth, Wimbledon, and Epsom District Gas Company regret that they are compelled to raise the price of gas by ⅜d per therm (approximately 2¾d. per 1000 c.ft.) from the taking of the meter indices at the Lady Day quarter; and this will apply to all consumers in the various areas supplied by the Company. This increase, which is due to the heavy fall in the values of residuals and the extra cost of living allowance, not only reduces the dividend payable to the stockholders, but also has the effect of reducing the profit-sharing bonus payable to the workmen.

Wembley Gas Exhibit.—Alderman George Ratcliffe (Chairman of the Leeds Corporation Gas Committee) emphasized the value of advertising, in the experience of the Gas Department, in the course of discussion on a grant to the Wembley Gas Exhibit, at a meeting of the Leeds City Council on April 1. He said he had always been a believer in advertising as a stimulus to trade, but he had never observed such remarkable results as during the past eighteen months in connection with the Leeds Gas Committee. They had had a surplus of more than 20,000 orders in the department within the past six months—every one of them for new consumers of gas. The Council agreed to grant £500 towards the new Wembley Gas Exhibit.

South Metropolitan Gas Bill.—In connection with the South Metropolitan Gas Company's Bill, the Croydon Town Clerk reports having obtained an undertaking from the promoters' agents: (1) To add a provision to clause 2, that any agreement therein authorized relating to working arrangements between the South Metropolitan Gas Company and certain other gas companies, shall be submitted to the Council of any county or county borough within which any part of the area of a party to the agreement is situate; and such council shall be entitled to make representations to the Board of Trade and be heard thereon before any such agreement is approved by the Board. (2) To add a new clause (7*a*) providing that the South Metropolitan Gas Company shall give notice by advertisement of the submission to the Board of Trade of any scheme for amalgamation or purchase under their Acts of 1876 or 1920 outside the Metropolis; that copies of such notice and scheme shall be sent to the county and county borough councils in which any part of an undertaking proposed to be amalgamated or purchased is situate; and that the Board of Trade shall receive any representations of such Councils thereon.

Inquiry at Blackburn.—On March 24, an inquiry was held by Mr. R. C. Cox, of the Ministry of Health, into an application by the Blackburn Corporation to borrow £60,000 for the installation of gasholders and other plant at the Greenbank Works. Sir Lewis Beard (Town Clerk) said that in 1916 the yearly output was 769 million c.ft. At present it was 1027 millions.

The Stoke-on-Trent Corporation Gas Committee are to spend £300 on repairs caused by storm damage at Etruria Gas-Works.

The Belfast Corporation have granted the free use of the Ulster Hall for a gas exhibition in September next.

The manufacture of gas has ceased at St. Anne's Works. Both plants in the borough of Lytham-St. Anne's (now amalgamated) are thus out of action.

Messrs. Tilley Brothers have, for family reasons, converted their business, which has been in existence for over a century, into a limited company, with head offices at No. 39, Victoria Street, Westminster—the premises at No. 53, Kingsland Road, E., having been disposed of.

At the annual meeting of the Tamworth Gas Light and Coke Company, Alderman G. Hoskison (Chairman of Directors) announced that the Company were going on satisfactorily. He moved that the usual half-yearly dividend of 7½ p.ct. on the old shares, and 5¼ p.ct. on the new shares be paid. Mr. Hunt seconded, and it was carried.

Speaking at a meeting of the Darlington Corporation on April 2, Mr. S. Long, Chairman of the Gas Committee, said that, though the Committee had given nothing this year towards the rates, they had benefited the town in many ways. They had found a considerable amount of work for the unemployed, and the price of gas had been extremely low.

The members of the Football Team of the Portsea Island Gas Light Company's Athletic Club played a semi-final match on the Fratton Park Football Ground against the Royal Marines on Wednesday last. Mr. Carmichael, the Engineer, and several members of his staff were interested spectators of a most exciting match, which ended in a victory for the Company's players by 2 goals to 1. Sound defence was a characteristic feature of the team.

At a social gathering at the Bridge Hotel, Newcastle, on April 3, five old servants of the Newcastle and Gateshead Gas Company, who have retired, were the recipients of presentations in the form of cheques. Two of the recipients, Mr. F. Lunn and Mr. J. Golightly, had almost 100 years' service between them, while the remaining three, Mr. W. Ellison, Mr. J. Farbridge, and Mr. C. Lloyd, had a total of over 80 years. They were all members of the Distribution Department. Mr. R. W. Copeland, President of the Welfare Club, presided, and the presentations were made by Mr. R. Fairless, Chief Inspector of the Distribution Department, who spoke in appreciative terms of the services rendered by the recipients.

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LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

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VOL. CLXX., No. 3231.] WEDNESDAY, APRIL 15, 1925. [77TH YEAR.

EDITORIAL NOTES.

The Coming Institution Meeting.

THE prospects for the Annual Meeting of the Institution of Gas Engineers, from June 9 to 12, are of a conspicuously attractive character. There may be good reliance upon the President, Mr. J. Ferguson Bell, M.Inst.C.E., to make the week technically profitable and otherwise enjoyable to the members and all visitors. Of the latter, there is expectation that we shall have the felicity of welcoming several from abroad. The mornings and afternoons of both Tuesday and Wednesday and the morning of Thursday will be devoted to the consideration of technical and business matters. But, dealing first with the lighter side of the programme for the week, there will be on Tuesday evening a reception and dance at the Connaught Rooms at the invitation of the President and Mrs. Bell; and after the morning sitting on Thursday there will be relaxation for everyone during the remainder of the week. On Thursday afternoon those who are in search of scientific and technical interest will have a choice of alternative visits. They may explore the almost boundless activities and the marvels of the equipment of the National Physical Laboratories at Teddington; they may go and investigate the plant under construction at the Fulham Works of the Gas Light and Coke Company; or the thorough character of the work constantly proceeding in, and the fine equipment of, the Chemical and Physical Laboratories and Burner Department of the South Metropolitan Gas Company will be open to inspection. This will be a magnetic feature of the afternoon's engagements. To both the Teddington and the Old Kent Road visits, ladies are invited, and at both places they may be sure of receiving a very cordial welcome. On Wednesday and Thursday evenings, there is confidence in saying that Wembley will draw numerous visitors from the gas men and their ladies assembled in London.

A glorious programme of interest and enjoyment has been arranged by the President for Friday. The only thing over which he has no control is that unruly element the weather; but we shall all pray that Friday above all days of the week will in this respect be of a propitious character. A special non-stop saloon train will early in the morning leave St. Pancras for Derby—the scene of the President's daily professional life. Not only will the Litchurch Lane and Cavendish Street Gas-Works, the Gas Offices, and the Showrooms be open for inspection, but the Locomotive, Carriage, and Wagon Works of the L.M. & S. Railway will be on view; and the ladies—and they only—are invited to visit the Royal Crown Derby Porcelain Works. We feel sure that such an opportunity of inspecting the processes and products of this world-famed place will not be missed by them. At lunch, the visitors will be the guests of the Chairman and Directors of the Derby Gas Light and Coke Company, who are proud of the position to which their General Manager and Chief Engineer has attained in the professional and administrative work of the gas industry; and they will be equally proud of his large following whom they will have the happiness of welcoming. This does not finish the pleasures of the day, for in the afternoon there is to be a motor coach drive to the celebrated Haddon Hall. The details of all these engagements were given in our issue for April 1, p. 59.

Regarding the meetings, honour is to be done to that prominent technician and administrator in the industry, Dr. Charles Carpenter, C.B.E., by the presentation to him of the much coveted and prized Birmingham Medal. The technical work which will engage the members is of a high order, and appropriate to these progressive times for the industry. There will be the President's Address, which is bound to be far-reaching in thought regarding current problems, of which he has a notorious aptitude for keeping abreast. Important items in the programme will be the reports of the Educational Advisory Committee, the Gas Investigation Committee, the Wrought-Iron Tubing Committee, the Joint Refractory Materials Research Committee, the International Commission on Illumination, and the Gas Research Fellowship. As to the papers, these are not numerous; there are only five, but they will—the names of the authors warrant us in saying—be of a quality which will give scope for excellent discussion regarding matters upon which we all require to know more and more, or to which closer and more serious attention should be directed. There will be from the members a rousing welcome for the President of the Société Technique de l'Industrie du Gaz en France (M. L. Rolland d'Estape) when on Tuesday he submits his paper on the "Tankless Gasholder at the Etablissements Arbel, Douai, France." The subject is one which has very live interest among gas engineers in this country. It is well known that a number of these tankless holders, of small and large capacity, are in existence on the Continent. But about them there is information British gas engineers would like to have. Among the questions that may be asked will be: Are they going to save capital expenditure in foundations, tanks, and iron or steel work by adopting the rigid form of holder in preference to the tank column-guided or spiral-guided forms? To what extent and in what ways are such holders likely to affect the cost of maintenance? If, on balance, this type of holder design (given equal capacities) does not save money, does it offer advantages superior in character and in the aggregate which would justify preference in their favour? There will be many inquiries—some critical; but we have no doubt that those engineers who have made a study of these holders will be able to satisfy their interrogators. Then Mr. W. M. Carr will present a paper on the "Selection, Design, and Construction of New Carbonizing Plant at Stretford." The subject is one which will give latitude for discussion. The members are again to have the pleasure of the presence of Prof. C. V. Boys, F.R.S. (one of the Metropolitan Gas Referees), who will submit a paper on "Developments in Gas Calorimetry," and not a few members will then hope to hear when they may expect that the new recording gas calorimeter will be prescribed by the Referees for adoption under the Gas Regulation Act. Another subject which demands from gas men earnest consideration is that of "Town Gas for Motive Power;" and this question will be submitted for consideration by Sir Dugald Clerk, K.B.E., F.R.S., who is pre-eminently qualified to infuse into the minds of gas men the desire for stronger activity in defending and expanding the position of the industry in this regard. Finally, there will be a paper by Mr. George Evetts, M.Inst.C.E., on the "Economics of Gas Production on the Thermal Basis." The mere mention of the

name of the author of the paper is sufficient assurance that what he presents will be a thorough investigation of the matter in hand. We heartily congratulate the President and Council of the Institution upon the technical programme and the attendant arrangements for the forthcoming meeting.

Cost of Inspection and Maintenance.

Scotland has taken a good part in the lead for the adoption of an "all-in" policy in respect of the inspection, adjustment, and maintenance of gas-consuming appliances, charging only for the material used. We are strongly convinced that the protagonists in this matter, whatever their geographical quarter, are right, and that they are doing a genuine service to the industry by pegging-away on all possible occasions at this really vital matter—especially those who practise to the full what they preach, and so can speak from experience. At three or four meetings of the North British Association of Gas Managers, the question has been under consideration, and is being kept to the front as a policy essential to the industry. Those who are the strongest advocates are those who have not only intimate knowledge of the old conditions of allowing the ways and means of utilizing gas to take care of themselves, as the indifference and ignorance of consumers permit, but have had experience of the advantage of supervision. We are confident that the relating of these experiences will do more to influence those who are still reluctant to adopt this policy than all the arguments, though irrefutable, without experience. Both arguments and experiences can be obtained from the valuable papers read by Mr. J. W. Napier, of Alloa, and Mr. George Keillor, of Greenock, which we published last week, and the notable statement by Mr. J. W. M'Lusky, of Glasgow, which we report this week. Of the facts of the question, all three have long experience as the foundation of their advocacy; all three tell us plainly that—proud as we may be of the progress the industry is making—there is in more cases than has even been dreamed of by many responsible gas men a condition of things existing the other side of domestic and industrial meters of which we cannot be proud, and which, with neglect of adjustment and maintenance in other cases, is the worst enemy to the stability of the industry which it has to face in these competitive times.

We do not wish on this occasion to labour the seriousness of the position; what we do wish is that those gas managers who have not yet made survey of the internal conditions in their area of supply, should do so, and then determine their policy, having regard to the keener competition which gas has to meet through electricity undertakings desiring the fuller development of, and greater diversity in, their loads. The gas industry has got to resist this by the best means at disposal; it has at the same time to develop its own load. As to the former, the most effective method is to incorporate in the trading policy an inspection and maintenance scheme, and that is also one of the best roads to the development of business. With the large connection the gas industry already possesses, it is more difficult than formerly to get new customers; but with competition surrounding, and with neglected lighting, heating, and cooking appliances giving indifferent service, it is easy to lose old customers. It is therefore an absolute necessity, in order to obtain increased custom through existing services, that there shall be satisfaction on the part of the consumers with their present appliances. That is so obvious that it is almost superfluous to write it; and yet apparently its significance is not appreciated by some administrators. Mr. Napier, Mr. Keillor, and Mr. M'Lusky, one after the other showed that inspection, adjustment, and maintenance, and the greater personal contact between consumers and competent representatives of their undertakings have brought about a larger demand for gas appliances which should be credited to the inspection and maintenance system—even though it is impossible to make a positive financial assessment to set against the cost of periodical house-to-house visitation to establish and maintain high efficiency. Beyond this there is a material credit in the retention of old customers, who, when once they have borne the cost of effecting a change, do not feel disposed to make a return, although they learn there is not the same economy and efficiency as under the older system when properly treated.

The question of the cost of adopting the policy of inspection, adjustment, and maintenance, is one that has perhaps, through a mistaken idea, caused much halting and deferment in adoption. The gas industry is the debtor to Mr. M'Lusky for the enlightening information he has from time to time furnished as to the financial aspect of the policy. Each time he has spoken in regard to it, the case has been better than on the previous occasion. The secret of this is that, as development of the application of the system proceeds, the cheaper it is per 1000 c.ft. or per therm to carry it on. We are also inclined to think that, as the rough places are made smooth in an area of supply, inspection, regulation, and maintenance become an easier matter; and, moreover, the competence of the men in the work becomes greater. These are in our view factors which operate to bring about a lower cost. It will be remembered that, after the work had started in a trial area in Glasgow, with its ghastly revelations as to what existed, Mr. M'Lusky estimated the cost at 1¼d. per 1000 c.ft. After a time, the actual cost was 1¼d. But now with the spread of the system, the elimination of what was bad, and the greater efficiency of the men through experience of the work, the cost has come down to 0·592d. per 1000 c.ft.—constituted of: Labour, 0·375d.; material, 0·084d.; and overhead charges, 0·133d. Per therm, the figures are: Labour, 0·08d.; material, 0·018d.; and overhead charges, 0·028d.—a total of 0·126d. It is estimated that in Glasgow there are 1,250,000 appliances in 213,447 premises; and now 995,038 burners and appliances are being maintained as compared with 410,000 appliances when Mr. M'Lusky reported upon the position last September. The number of appliances has increased by 140 p.ct.; and the expenditure has been reduced as stated from 1¼d. to 0·592d. per 1000 c.ft. There might be a slight increase in the cost in more restricted areas; but there may be good confidence, based on the experience of Glasgow, that the initial costs per 1000 c.ft. or per therm or per appliance will be reduced to a modest figure. The question is, Is the result worth the expenditure? Our reply is positively in the affirmative. What is the cost of the loss of custom and a heavy complaint list in comparison? Does the Glasgow consumer object to paying 0·126d. per therm more to realize a higher efficiency, a lower gas account for an equivalent amount of work, and greater satisfaction? The expenditure pays the consumer, as it certainly does the gas undertaking.

Coking Experts and the Coke Competition.

The question has been put to us whether technical men engaged in coke-oven practice are eligible for participation in the Coke Competition. We may say at once that welcome will be given to contributions from any source which in any way contain suggestions of value in respect of coke to the gas industry; and this applies to the technical men engaged in the coking industry. There are various reasons why they should come in as participants. There is no question from what is seen to-day in respect of the business relations between the coke-oven industry and the gas industry that—gradually it may be, but certainly—the two industries will have to draw together closer and closer. In respect of the question of the co-ordination of the utilization of the fuels of the country, we have the growing transfer of coke-oven gas to suitably situated gas-supply undertakings; and the millions of cubic feet so purchased annually is a largely growing quantity, and this is likely to continue to be so. Also in respect of sulphate of ammonia and benzole, the two industries are co-operatively concerned in propaganda and sales. Thus the tendency is for closer identity between the two industries; and, looking forward, it is easy to conceive that in time they will present a still more united and common front. Furthermore, the difficulties of the coke industry in regard to the demand for metallurgical coke being far short of productive capacity have, through industrial depression during the past few years, been very great; and the prospect is that, with the return of better conditions on the Continent, there may be a further substantial decline

in the requirements of other countries for our furnace coke. Therefore, naturally, the coking industry has been looking round to ascertain in what way it can extend its markets for coke; and it is now well known that there are coke-oven plants which are producing coke suitable for domestic and industrial purposes. Taking all these things into consideration, we could not shut out from the competition the ability and talent which exists in connection with coke production in the related industry. But, in saying this, our friends of that industry will bear in mind that the object of the competition is primarily to encourage improvement in the production, handling, and utilization of domestic coke, though this is not the sole aim.

Publicists and the Coal and Power Problem.

No excuse need be offered for referring to this subject so soon after the Southern Association meeting, because the gas industry (as has been frequently emphasized in these columns) is so deeply concerned in altering, to the advantage of the nation at large, the threatened trend of things. We are sorry to see that so many of our publicists who are influences in shaping public opinion, are, through nescience and misunderstanding, helping to do the shaping in the wrong direction. These publicists require to be educated to see the error of their ways in this particular. Take as an example Mr. G. L. Garvin, whose articles in "The Observer" are always widely read. In the course of a recent outpouring on the subject, he alluded to electricity and oil as being the great solution of our problem. Whittling down what he said, we come to super-power stations and low-temperature carbonization. He predicts that the World Power Conference at Wembley last year taught us many lessons; but we fear that, in the multiplicity of counsels, Mr. Garvin has lost his way. He also credits Mr. Lloyd George with having rendered better service on this subject than any other public man, though he made the incidental error of mixing democratic emotion with a severely technical subject. We feel that Mr. Garvin's view should have a wider application than to Mr. Lloyd George; perhaps it might with excellent validity be applied personally. We agree with him absolutely that, "if we mean to be again a progressive and thriving and confident nation," we must undertake "a technical revolution on a national scale by making a modern use of our basic product coal." But our views distinctly disagree as to the nature of the "technical revolution." Mr. Garvin submits that coal should be converted at super-power stations partly into electric current available for "machine force," transport, heat, and light throughout the country; partly into fuel oils and other valuable derivatives. It would be interesting to know the fundamental data upon which this moulder of public opinion bases his ideas of what should be done.

For our own part, we object to coal being used, especially for producing electricity for general heating, at super-power stations at from only 18 to 20 p.ct. efficiency, the energy being transmitted about the country at heavy cost and loss. These are technical matters that popular writers do not understand, nor can they be expected to do so. "A clean and smokeless civilisation" is not to be obtained through the uneconomical means Mr. Garvin suggests—uneconomical to both the nation and the individual. The gas industry can show a better way; and if Mr. Garvin will only study the economics of the question from all points of view, we are confident he will become a convert to the proposal for an examination of the whole question from all points of observation, and not from the single one which appears to be so popular in the lay mind. The same thing might happen if the Minister of Transport and Minister of Mines would study the problem from other aspects than the one on which they have been steadfastly keeping their eyes, as though there was no possibility of there being any other. The Minister of Mines, states Mr. Garvin, recently described "the new use of coal" as our one ray of hope; and he went on to remark: "I have authority to say that the Government "are going to spare no money, no energy, and no effort "to bring this process to perfection." It is to be hoped in the national interests that they are going to do no such foolish thing. As a nation we cannot afford it. We want economy, and not a blind headlong rush into greater uneconomy.

As to the low-temperature coal carbonization process, it has a lower thermal efficiency than the high-temperature one; and the present state of the markets for the secondary products ought to be a warning to the visionaries that any pre-carbonization of coal by low temperatures would not reduce the generating costs of electricity, but would raise them to a figure which would make the electricity industry rock with anger against those who had, through stupidity and resistance to full inquiry, led it into such a mess. Our advice to publicists such as Mr. Garvin is that they should make certain they have the basic facts, and not accept the hypothetical assurances of any non-technical person who comes along with a superficially plausible tale, or persons interested in particular processes or plants. The same comments apply in major part to a paper read by Mr. Johnstone Wright, the Belfast Corporation Electrical Engineer, at a recent meeting of the local Association of Engineers. In the course of this, he stated that of the strictly technical problems of the future, so far as electricity production is concerned, the first is a more complete realization of the value of fuel. The change in the last few years in the value of fuel—not only measured in terms of currency, but in terms of human effort—has turned upside down all our previous conceptions. Mr. Wright thinks it is probable that the solution lies more in selective low-temperature carbonization with recovery of useful products. But we will give him credit for realizing the speculative side of the proposal; and the effect this would have in causing uncomfortable oscillations in the cost of generating electrical energy. The element of speculation is, in fact, formidable to Mr. Wright; and, in his opinion, might alarm investors and affect the facilities for raising capital. In view of this, he submits that an ideal distillation scheme is wanted—one which would enable the user to vary rapidly the classes of bye-products, so as to meet changing markets, and, to ensure success, one that would be financially safe, even if a large part of the products were used for power generation. It is something to find in one quarter a recognition of the element of speculation. Having got so far, Mr. Wright should explore the commercial aspects, and perchance he will find that the whole range of secondary products from coal carbonization has dropped considerably in market value, and that unfortunately simultaneously. In such circumstances, it is impossible to see how even the ideal system that he has adumbrated in his own mind would, through the varying of the products according to the state of the markets, ensure success. There can be no assurance of success. The position is altogether different with the high-temperature process, the gas therms from which have a large constant market at a much lower cost than low-temperature gas or electricity can offer.

It may be charged against us that we are prejudiced in favour of high-temperature carbonization, and, in the interests of the gas industry, of a better co-ordination of the utilization of our national fuel supplies. If there is prejudice, it is born of the knowledge of the economic advantages in comparison with the situations occupied by the various vague and unsubstantiated schemes which have been put forward. No one is asked to accept our statements without the fullest investigation. It is such investigation that the gas industry desires shall be made in the national interests before it is too late. If our publicists desire to take a hand in some really good work, it should be in urging such an inquiry, and not accepting as being of proved soundness and validity such ideas as are confidently put forward by Mr. Garvin, and as pointed to as directive by Mr. Wright. The days have passed for piecemeal treatment of such a highly important matter; the days are here when thoroughness and comprehensiveness should be showered upon the solution of the fuel, power, and heat problem of this country.

Wembley Opening.

The former announcement as to the opening of the British Empire Exhibition has been cancelled. The day is now fixed for Saturday, May 9; and the ceremony will be performed by the King, who will be accompanied by the Queen.

London Gas Price Advances.

As was foreshadowed at the recent annual meetings of the proprietors, the London Gas Companies have had to raise the price of gas. This has been absolutely essential, in view of the serious fall in the values of secondary products, and the higher wage payments. The necessity for an increase of price having arisen, it is good policy not to defer it, in view of the fact that, in the lighter months of the year, the consumers will feel the increase less than they would during the winter season. In the case of the Gas Light and Coke Company, the increase is from 8·6d. to 9·4d. per therm. The South Metropolitan Company have raised their charge from 8d. to 8¾d. per therm. The Commercial Gas Company's price has ascended from 8½d. to 9⅝d. The Wandsworth Company have advanced the differential prices ruling in their areas by ⅜d. per therm.

Industrial Rating.

Regarding the rating of industrial establishments, the gas industry will have much sympathy with the views of the Federation of British Industries which were at a recent interview laid before the Minister of Health. The basis of assessment at the present time differs as between area and area; and this is distinctly inequitable from the point of view of competition in different trades. The gradual extension of the assessment basis has also added to the burden of rates borne by industry. The recommendations of the Inter-Departmental Committee appear to propose to establish by Bill the present basis of assessment, with the proviso that only a proportion of process machinery is to be included for valuation purposes. To these recommendations the Federation are strongly opposed; mainly on these grounds: (1) Equity in comparison with other classes of rateable property; (2) equity between industries; and (3) uniformity. The Federation hold that uniformity can only be obtained by accepting the net rental value as the basis of valuation. To assess this rental value, they submit there should be taken into account only land, structure, and first motive power producing plant, and that this rental value should be adjudged taking into account the normal working hours of the particular industry concerned. In view of the great divergencies of practice in different factories for power purposes, the Federation suggest that the power plant should only be taken as far as the control of the first producing plant. Where energy is purchased from an outside source, there should be no assessment of the power plant unless a converter or transformer is used. It is, however, left open as to whether gas-engines should or should not be assessed where gas is purchased from an outside authority. The Federation are of opinion that the policy they recommend would be a distinct incentive to manufacturers to employ the most up-to-date plant, and to make the replacement of out-of-date plant a subject less to be feared than it is at present. This naturally would result in a general improvement of industrial efficiency.

The Factory Bill.

It is understood that the Government have decided that the Factory Bill shall not be deferred to next year, as formerly intended, but shall be introduced as early as possible after Easter. It is said that the measure contains about 140 clauses. Though largely a Consolidating Bill, it incorporates several new proposals, some of which are calculated to arouse considerable controversy.

Co-partnership Bill.

The Co-partnership Bill was recently introduced for second reading in the House of Commons; but there seemed to be little enthusiasm over it. Indeed, after the mover and seconder had spoken, the opponents—Labour-Socialists and an Arch-Communist—fired volleys of platitudes at it, with the result that the measure was talked out.

The Vauxhall Colliery Lesson.

A short time ago we referred to an interesting experiment which is being made by the miners at the Vauxhall Colliery, near Wrexham. It will be remembered that owing to output and costs and lower market values, the owners determined to shut down the pit; but the men are now proving that, if they choose to exert themselves, they can not only earn more money, but can convert a losing concern into a paying one. They entered into an agreement with the owners to work the pit rather than be thrown out of employment. The conditions included a guarantee that the men should bear any loss. To protect themselves, a guarantee fund has been raised by them. Some of the miners at other collieries have subscribed towards the fund; and the men have been encouraged by promises of contributions from other quarters. The fund, however, is purely for protection purposes; and it is hoped it will not be required. So far the men are perfectly contented. They are working full time; but their wages have already increased. Very few coal getters in the district are receiving the minimum wage of 9s. 6d. per day; but the week before last, the wages book of the Vauxhall men showed they were earning from 12s. to 18s. per day. The North Wales Miners' Association appear to be troubled as to the line of action they should adopt towards these members, who have dared to labour in a way which is to their personal advantage, but opposed to the policy of the Union. We can understand the Executive of the latter being disturbed by the proof that is being given as to the ability of the men to work to greater productivity, and so gain an increased rate of pay. The Executive of the Union proposed that the men should be expelled for three months; but they have gone on despite the excommunication threat. There is some uncertainty, too, as to the attitude over the matter of all the miners in the area, some of whom have gone so far, as already said, to subscribe to the guarantee fund. We like the sportsmanlike spirit that this shows; it throws into stronger relief the pernicious policy of the Union. No decision, however, has yet been arrived at as to Union membership of these men who are looking after themselves rather than be slaves to the policy of the obscurant Union rulers.

Synthetic Nitrogen.

In the House of Commons recently, questions have been asked as to the purchase from the Government of the nitrogen "factory" at Billingham by Messrs. Brunner, Mond, & Co., Ltd. The suggestion is that the terms were unduly advantageous to the firm. There is not the slightest foundation for this, judging from a letter from Colonel G. P. Pollitt, a Director of Synthetic Ammonia and Nitrates, Ltd. When taken over, the factory consisted of a number of fields, not drained, and only partially provided with roads and railways. Not a single building other than contractors' temporary huts and sheds for stores had been erected. The general stores on the site, the contractors' plant, the roads and railways, and the contracts entered into by the Government were finally agreed by the representatives of the firm and of the Disposals Board at £495,000. The Company have carried out to the full the wish of the Government that the synthetic nitrogen industry should be established in this country. As a consequence, it is claimed that not only have they largely increased the supply of fertilizers at less than pre-war prices in this country, but they have also rendered it independent of Chilian nitrate as the chief source of our national explosives supplies. It is added that anyone familiar with the precariousness of the position with regard to fixed nitrogen in the last war will realize that this achievement is of the highest national importance.

Poplar Wages Surcharges.

The Poplar Borough Council have had to climb down in connection with their extravagance in the payment of wages; and they are now in a serious dilemma. It will be remembered that the District Auditor made a surcharge of £5000 on members of the Council in respect of wage payments during 1921-22. The matter has been contested in the Courts; and the House of Lords has upheld the surcharge. Now the Council have been brought to their senses, and have resolved to consider the whole question with the view to bringing wages into conformity with the decisions of the Courts. As the same time an appeal has been made to the Ministry of Health, asking that the surcharges be remitted; the grounds being that the matter has been one of great difficulty, and one which was novel and of vital importance. It is also desired that the costs of the proceedings shall not be made the subject of a surcharge. It is evident, however, that the Council are unrepentant, as they say that, under protest and with great reluctance, they propose to consider the whole question of wages with the view

:o conforming with the decision. They plead that they are in i quandary owing to the fact that neither the Court nor the Auditor has stated what wages can be paid. Detailed consideration is therefore required; and they are prepared to promise there shall be no unnecessary delay. It should be easy enough for the Council to ascertain what is paid for similar work by councils who have not been surcharged. Anyway, the Poplar Council have now learned that ratepayers must be protected against the extravagance of partisan councillors.

PERSONAL.

Mr. J. Hood, Chief Technical Assistant to the Shrewsbury Gas Light Company, has been appointed Assistant Engineer and Works Manager to the Cheltenham Gas Light and Coke Company. Last year Mr. Hood was awarded a First-Class Diploma in Gas Engineering under the Education Scheme of the Institution of Gas Engineers; and he has since been elected a full member of the Institution.

Mr. F. Allen, B.Sc., has been appointed Assistant Engineer to the Bedford District Gas Company. Mr. Allen graduated at Leeds University in 1923, since when he has been assisting Mr. F. A. West, of the Newark Gas Company.

Mr. H. Taylor, formerly a member of the staff at the Central Laboratory of the Birmingham Gas Department, has taken up the position of Chief Chemist to the County Borough of Blackburn Gas Department.

Mr. W. G. S. Cranmer, Manager of the Willenhall Gas-Works, has been re-elected a member of the Short Heath Urban District Council.

Mr. Albert Whiteley (the Manager and Secretary of the Kirkburton Gas Light Company, Ltd., near Huddersfield), has been appointed a Director of the Shelley and Shepley Gas Light Company, Ltd., Shelley, near Huddersfield.

The Megiun Vertical Rotary Retort.

Mention is made by "Engineering" of the rotary low-temperature retort of the Megiun A.-G., at Butzbach, which, it is stated, differs from others chiefly in one respect. The retort is externally heated; but the vapours liberated collect in the central portion of the retort, where they are protected against over-heating by a double shell of steel and the coal under carbonization. The retort consists of a vertical drum rotating at a rapid rate within the setting. Inside this drum revolves a second drum, at a slower rate. The two drums are supported on the same vertical shaft. The outer surface of the inner drum is fitted with a helical conveyor fin, and the coal descends on this helix in the annular space between the two drums. Owing to the rapid rotation of the drum, the coal is thrown against this shell, which is exposed to the furnace flames, especially in the upper portion. The lower portion of the furnace is not heated. The inner shell is perforated, and the vapours liberated pass through the perforations into the inner space of the retort, which is much wider than the annular space. From this inner space, the vapours are withdrawn upward. Experiments which have been continued for several years in a small plant show, it is said, that a superior low-temperature tar is produced, fairly free from dust. The further product is a good semi-coke. Experiments have been made with various coals and lignites; and a point of interest is that coal dust and lignites high in earthy constituents, otherwise not amenable to retort treatment, have been carbonized.

Institution of Chemical Engineers.—At a meeting of the Institution to be held in the hall of the Chemical Society, Burlington House, Piccadilly, on Wednesday, April 22, a paper entitled "Continuous Distillation of Petroleum" will be presented by Mr. A. M. O'Brien, F.I.C., M.I.Chem.E. The President of the Institution (Sir Arthur Duckham, K.C.B.) will take the chair at 8 o'clock.

Eastern Counties Gas Managers' Association.—The President (Mr. F. A. West) will receive the members and guests at the Gas-works, Barnbygate, Newark, at 11.45 next Wednesday (April 22), on the occasion of the half-yearly meeting; and they will afterwards be entertained at luncheon by the Chairman and Directors of the Newark-on-Trent Gas Company, in the Clinton Arms Hotel, Market Place, at 1.30. At 2.45 the business meeting will take place in the hotel; the agenda including the President's Address and a paper by Mr. C. B. Donkin, associate member, on "Gas for Industry." In the evening there will be the annual dinner; and for the following day a drive has been arranged from Newark to the Chesterfield Works of Messrs. Bryan Donkin & Co., Ltd., where special furnaces to be described in the paper already referred to will be shown. The members will be the guests of the firm at luncheon.

ELECTRICITY SUPPLY MEMORANDA.

In the work of the Electrical Development Association, Mr. R. Hardie, of the Glasgow Corporation Electricity Department, has become quite a favourite person since electric cookers were let on hire in that city. In the

Cooker Hire Charges.

"Memoranda" last week we referred to his paper at the last (for the session) Salesmanship Conference in London. Since then he has been in Leeds lecturing at a local Salesmanship Conference. His subject on this occasion was "Electric Cooking Problems"—the same old problems, in a new dress of words. In his prefatory observations, the lecturer emphasized the fact that the questions of installation costs, hiring charges, and (most important) running costs, weigh very heavily with consumers in coming to a decision in regard to electric cooking. As to the hire charge, he stated that for the first year it was £1, and 10s. per annum afterwards; and this sum includes special wiring, which costs £2 10s., together with a kettle and kettle-board, which cost £1 10s. This brings the total capital outlay to approximately £16. It seems to us that, the capital outlay amounting to £16, the hiring charges will not liquidate the sum before the expiration of 31 years, to say nothing of interest and depreciation. There may be some explanation; but, as we read the reports of the lecture, the user pays £1 the first year, leaving £15 to be discharged at the rate of 10s. per annum thereafter. If this is so, then one can fairly say that the apparatus will be worn out or obsolete long before the capital has been wiped-out by the hire rates mentioned by Mr. Hardie. The Department, it appears, have been in a bit of a quandary regarding the correct hire charge to make. In the initial stages they imposed a charge of £2 per annum; and it is acknowledged that they had many grumbles in respect of this because in Glasgow gas cookers are installed free. Hence the reduction. Mr. Hardie also admits that, in spite of the attractive tariff, they have occasionally received complaints of excessive running costs, which, of course, he alleges are due to extravagant and improper use.

Satisfactory, and Yet Not So.

The lecturer proceeded to state with confidence that the modern electric cooker is satisfactory in the hands of the average careful operator, owing to the improvements which have been effected during the past three or four years. But as we read on, it is found that the hotplate, which is the largest absorber of electrical energy, is still in an unsatisfactory and inefficient state. How can there be complete satisfaction with this defect in a vital part? Mr. Hardie holds that the oven and the grill are both good features—in fact, like a good honest electrical salesman, he says that these features are superior to any competitive apparatus. But as to the hotplate, he says: Surely there is sufficient ability in the electrical ranks to provide one which will embody improvements suggested from time to time by experts! He goes further and suggests that the "E.D.A.," or the "I.M.E.A.," or the "B.E.A.M.A." might offer a substantial money prize to the producer of a cooker boiling-plate which would at once be speedy and indestructible; one condition being that the minimum efficiency shall be 50 to 60 p.ct. For many years the manufacturers of electric cookers have been trying their utmost to secure precisely what Mr. Hardie now advocates a prize should be offered for; and they have not succeeded. Had they done so, the indestructible and highly efficient boiling-plate would now be part of the ordinary electric cooker. There are many physical and other difficulties in this regard—difficulties due not only to the heating medium itself, but to the use to which the boiling-plates are put by householders. It is not an easy matter; and Mr. Hardie knows this quite well, otherwise we are confident that he would make a memorial for himself by producing the thing required. However, this gentleman, as we showed last week, is of a most ungenerous disposition, and cynical where gas is concerned. He seems to be particularly fond of trying to besmirch the gas cooker with all the calumny which prejudice can suggest, which is dangerous. In this particular lecture he says that the gas industry has taken thirty years to produce what it describes as the "perfect" cooker; and it gained its knowledge not only by workshop or laboratory tests, but by experience with apparatus under actual working conditions. In the interim, in spite of the "imperfect" apparatus, it has succeeded in building-up an enormous cooker business. If anything, that statement is (though unintentionally so) against Mr. Hardie himself, in view of the fact that, notwithstanding the "imperfections" of the gas-cooker, the electricity supply industry has not been able to build up an enormous cooking business. The public are evidently the better judges of the relative perfections or imperfections of the two systems of cooking; they certainly know on which side is to be found household economy in respect of money, time, and range of utility. Hence the 5½ million of gas cookers and grillers which are to be found in use in England, Wales, Scotland, and Ireland.

A Heavy Capital Expenditure.

Of course, one great obstacle to the development of the electric cooker is its very high price. Mr. Hardie points out that while a gas cooker costs about £4 the electric cooker costs £12 10s. We would add that the extent of the capabilities of a gas cooker which costs about £4 are a long way ahead of those of an electric cooker which costs £12 10s. It is admitted that it may be reasonably expected that the electric cooker will cost more than a gas cooker, but our Glasgow friend thinks that three times more is too much, and therefore a reduction of price is imperative. An important point is made in this connection. The capital expenditure involved in the hiring-out of electric cookers at such prices as those now ruling would be immense if the business developed in any substantial measure. In our opinion, such capital expenditure will be avoided by the limitations set on demand by the electric cooker itself. In Glasgow, for example, Mr. Hardie states they have at present on hire 1400 cookers which involved a capital expenditure of over £20,000. Our friend appears to have been shocked by what results from multiplying that figure by five, inasmuch as he describes it as "appalling." Multiplied by five, the number of cookers only becomes 7000; but the capital expenditure £100,000! Mr. Hardie thinks that little can be done in cheapening the cost of electric cookers unless a factory is provided and equipped for mass production. He is afraid that at present the majority of firms engaging in this class of output regard it as purely a side line.

Electric Cables and Street Explosions.

In the "Journal" for March 25 (p. 751), paragraphs appeared referring to two street explosions. The first related to an explosion at Notting Hill Gate, which sent into the air six electric light distributing boxes, and damaged about 300 ft. of pavement. The other explosion was at Acton, when four men were injured. The explosion wrecked the bars and blew out the windows of a public house. Regarding the latter uncomfortable incident, Mr. G. L. Jennings, of the Brentford Gas Company, in our issue for April 1, pointed out that this explosion was not in any way connected with the gas supplied by his Company. It was caused by the fusing of a long length of electric cable, which gasified some of the bitumen coating. The gas so generated was the cause of the trouble; coal gas not being in any way concerned. The unpleasantness with gas electrically generated from the bitumen coverings of cables is an old-standing one; and it was a fortunate thing for the gas industry when explosions up North and in the Midlands caused the identification of the real culprit in the matter. Prior to these occurrences, it was always charged to the gas supply that leakage of gas into electric cable culverts was the actual cause of street explosions. But now, as in this Acton case and in the Notting Hill Gate one, it is frequently possible definitely to prove that the electric cables themselves are solely responsible for these happenings. In the "Electrical Review," Mr. W. Love, writing on the Notting Hill Gate upheaval, alludes to the common assertion that such incidents are caused by leakage from adjacent gas-mains, and he says that no other cause has hitherto been suggested. Of course, in this he is totally mistaken. However, he advances another theory for some of these explosions. He says he is deliberately of opinion that they are attributable to electrolytic decomposition of water or humidity, and the ignition of the resultant gases by short circuit, &c. To this conclusion he has been led by the fact that such explosions are always extremely violent—a constant characteristic of the inevitably correct proportions of oxygen and hydrogen produced by electrolytic decomposition. On the other hand, an explosion of gas might occur with wide variations in the proportions of gas and air. Anything above or below the critical mixture considerably weakens the explosion which at its best or worst is mild in comparison with the violence of the absolutely correct mixture produced by electrolysis. To know the cause is the first step towards finding the remedy. We hope in the public interests the remedy will be found.

The "E.D.A."

The Electrical Development Association appear to be making somewhat slow progress in increasing the membership. To this opinion we are led by statistics which appear in the annual report of the Council of the "B.E.A.M.A." for last year. As a matter of fact, the net accretion in membership of the Development Association was only from 1166 to 1172 during the year. Of this number, municipal undertakings represent 100, companies 87, manufacturers 244, contractors 741; but some of the concerns have raised the amount of their annual subscription. It is also learned that, in addition to the ordinary revenue of the organization, nearly £25,000 was contributed last year by 264 supply undertakings towards the display organized by the Association at the British Empire Exhibition. The latter figures show that the administrations of a considerable number of supply undertakings refused to dip into their funds to help in the co-operative display at Wembley. We know too that prior to the Exhibition of last year, as well as during its course, there were several hints in the electrical Press regarding the difficulties that the Association had had in raising the sum necessary for making an effective display during the six months.

Local Exhibitions.

In the same report there is a reference to exhibition policy. The managements of electrical undertakings seem to be unanimous in the opinion that the manufacturers of electrical appliances have unlimited resources—financially, and in respect of spare goods. Before the question of exhibiting at Wembley last year was talked about, there had grown up in the electricity industry a large demand on the part of undertakings for local exhibitions, with the view of stimulating the business of their enterprises. These exhibitions were promoted by both municipal and private concerns. They overlapped as to subject, and there was conflict in date—in fact, there was no system of any sort in their organization. Naturally, this created a great deal of perplexity among those firms who would wish to be of assistance in such matters, but who were debarred by the real complexity of conditions from doing what they would otherwise have done. The report before us states that even before Wembley closed its doors last October, this movement had been revived, and had since grown almost to an epidemic. It is said that the taking a hand in such exhibitions by members of the "B.E.A.M.A." is, by a clever system of "snowballing," rendered almost an obligation upon them. But the Council of the Association now feel that the whole position will have to be reviewed. They are wise in this. The appliance manufacturers connected with the gas industry would be equally averse to being assailed in the same manner—amounting almost to persecution. Certainly what is described is an unfair drain upon the resources of the various electrical firms.

April 1.

On this date "Electrical Industries" published a paragraph, "Gas Refused." In the course of it the remark was made: "If we were so inclined, we might call the attention of the 'Memoranda' contributor of the 'Gas Journal' to this awkward bit of news, and ask him to explain it away with his pretty wit; but we do not like to ruffle anybody unduly—so we won't mention it." The writer of "Gossip" in our contemporary need not be afraid of hurting the feelings of the writer of the "Memoranda," and particularly in connection with the matter in hand. It refers to the ventilation of a certain section of the offices of the Glasgow Corporation Gas Department, and to a proposal to instal electric lighting in it. We need not re-enter into this matter, in view of the fact that, on the same date as our contemporary appeared with its invertebrate paragraph, the position of this question was explained in two paragraphs in the "Memoranda" under the headings of "Circulating Falsehood" and the "Present Position." If the writer of "Gossip" will refer to those paragraphs, he will obtain some useful enlightenment.

Gaseous Fuels for Furnace Heating.

In a recent paper before a meeting of the West of Scotland Iron and Steel Institute by Prof. R. V. Wheeler, the author discusses the relative merits of carbon monoxide and hydrogen for furnace heating. Though both have the same calorific value, a carbon-monoxide flame radiates nearly 2½ times as much heat as a hydrogen flame burning the same volume of gas. On this score alone, therefore, a high content of carbon monoxide is preferable to a high content of hydrogen in a producer gas for furnace work. The rates of burning of hydrogen and of carbon monoxide in contact with heated surfaces are widely different. Surface combustion, though it can be usefully promoted in certain circumstances, may prove deleterious in an ordinary furnace, in view of the fact that the production of local high temperatures is harmful to the furnace walls, and materially shortens their life. Hydrogen when mixed with air is far more susceptible than carbon monoxide to the catalytic effect of heated surfaces. For this reason the destruction of brickwork in a steel-melting furnace is more rapid, and the wastage of material in a reheating furnace is greater, when the producer gas used contains a high proportion of hydrogen. With regard to the use of coke-oven gas for furnace heating, the methane and, to a lesser extent, the carbon monoxide stabilize the flame; and the hydrogen and carbon monoxide, by reason of their wide limits of inflammability, ensure the "adaptability" of the gaseous fuel. The chief advantage claimed for coke-oven gas is that the working temperature of the furnace can be increased so that about 25 p.ct. increased output can be obtained; while difficulties encountered in its use are the tendency of the flame to rise to the furnace crown and fuse the brickwork (because of its low density compared with that of producer gas), and the low luminosity of the flame (owing to the freedom of the gas from tarry vapours) which renders difficult observation of the conditions in the furnace. Both difficulties can be overcome by using tar in addition to the gas; and, since the use of coke-oven bye-products in this manner dispenses with gas producers and simplifies the construction of the furnaces, no doubt the practice will spread.

EFFICIENCY IN GAS-WORKS.

A New Point of View.

By "Psychologist."

The word "efficiency," when used in relation to the working of gas undertakings, is usually associated with technical advances, and in general little heed is paid to what may be termed the human side of the question. Large sums of money—quite rightly—are spent annually on purely scientific research, but too little effort is made to increase efficiency by studying the conditions under which the gasworkers do their work. From time to time, of course, improvements are made in working methods in (say) the repair shops of the larger concerns, but these improvements are casual, and are not based on a real appreciation of the existing conditions. It is only by intimate contact with, and careful examination of, the particular work and the particular circumstances that the defects of an existing system can be realized; and the management, who perhaps only spend a few minutes in the shops each day, cannot grasp them. It is impossible for them to discover the means by which working conditions can, in small ways, be so changed as to increase the efficiency and happiness of the worker, and, through this, the output of work per man.

Those Little Things.

What are regarded as the trivialities of life are often, in the mass, of far more importance than the events which appear outstanding; and so it is in work—the minor and so-called unimportant details are in the aggregate of major consequence. The scientific outlook has resulted in amazing progress in every field of the gas industry's activities; and it is suggested—and the suggestion is based on results—that industrial psychology can do much to increase efficiency in other directions in all these fields. In this short article it will suffice to take two examples of the application of psychology to the gas industry—first, in a stove and meter repair shop; secondly, in the selection of suitable workers for the industry.

National Institute of Industrial Psychology.

The work is being carried out by the National Institute of Industrial Psychology. The first thing they do is to send an investigator to the job, so that he may find out exactly what are the physical and mental requirements of the work. No recommendation is made to the management until the investigator has spent at least a month in the particular shop which is under test, and has thus become intimately acquainted with the work and the prevailing conditions. In the meter repair shop of a large gas company, it was found that the handles of the soldering irons were two inches too long—a small point to the management, certainly; but not a triviality to the man who has to use the tools every day of his working life. This defect was rectified, and the results were amazing. Then it was discovered that the workers were much less tired at the end of a day's work if they were provided with wooden footboards which allowed free circulation of air. It was also found that by attention to efficient lagging, the workers were far less affected by the heat from the soldering-iron stoves. In the stove repairing shop similar small changes were effected, or new apparatus introduced. Brushes, tools, devices for lifting, and many other points were examined closely, and improvements were made. These improvements, in themselves small, were, taken together, of first-rate importance; not only did they increase the efficiency and output of the shops, but also, by relieving discomfort and doing away with unnecessary expenditure of energy, made the workers much happier.

Square Pegs for Square Holes.

In any industrial concern it is easy to appreciate the difference in value between an efficient and an inefficient worker. It is not as though the inefficient worker were merely a nuisance to himself; he is a nuisance to everyone around him, and lowers the working rate of his associates. Two or three men who are obviously unfitted for their work can often spread discontent throughout a shop. The object of the National Institute of Industrial Psychology is to assist in the choice of the right type of man for a particular job. First of all the mental and physical requirements of the job are found—in some work, for example, manual dexterity and keen eyesight are demanded. Then apprentices, &c., are chosen who have the necessary qualifications. This selection is much better than the ordinary procedure of examination and interview. Psychological investigations have been carried out in polytechnics in London on tests for the admission of apprentices to the various branches of engineering work; and these are now being applied practically and with success in two large Manchester works. Definite occupations require well-defined qualities in the youth who intends to take up the work. A meter inspector, for example, should have a memory for figures. In the case of a draughtsman, apart from the technique and conventions of drawing, the ability of "seeing into the solid" is essential for this type of worker. The same ability is a necessary factor in the sheet-metal trades. There the men start from the flat to work the metal to the three dimensional. True, they may work to templates, but these should be for testing and correcting in the majority of cases. The work in the main depends on a particular ability of space perception. So one could continue; but sufficient has been said to indicate that increase of efficiency in the gas industry does not depend wholly on technical considerations, and that probably the incorporation of psychology will form the starting point of new advances.

COAL AND CARBONIZATION.

A meeting of the Birmingham and Midland Section of the Society of Chemical Industry was held on Tuesday, March 31, at the University of Birmingham. Prof. G. T. Morgan (Chemistry Department, Birmingham University) presided, and there was a good attendance of chemists and others interested in the chemistry of coal, oils, and other minerals.

Dr. R. Lessing read a paper on "The Inorganic Constituents of Coal." He pointed out that no less than 25 million tons of non-combustible material are annually distributed in Great Britain. Leaving out of consideration the potential value of iron, sulphur, and building materials, which may in the future be recovered from the coal minerals, the inorganic constituents are worse than useless, and involve the nation in a non-productive expenditure of millions of pounds, absorbing, for example, 10 to 15 p.ct. of the mineral traffic of the country.

Dr. Lessing proceeded to classify the mineral constituents according to their origin from plant material, decomposed rock, saline deposits, before, during, and after coal formation, and their products of interaction. He referred to the work of Dr. Marie C. Stopes on the constitution of coal, and to his own work, as well as that of Sinnatt and others, on the mineral matter in coal. He showed from detailed analyses that clarain and vitrain contain only original plant ash, and that durain is a mixture of small plant entities such as spores and cuticles. He showed that the largest proportion of ash was derived from the roof, floor, and dirt-bands of coal seams, and that the inherent ash of pure coal did not exceed 3 p.ct.

The lecturer then described and demonstrated experimentally his method of separating coal quantitatively into its ingredients by his combined elutriation and float-and-sink method. He pointed out that this method afforded a means of coal classification on a rational basis. He insisted that the ash content should be allowed for in any method of classification. Dr. Lessing proceeded to demonstrate the significance of his experimental results for practical coal problems. He pointed out that the elucidation of the morphological structure and chemical constitution of coal was a first condition for success in solving these problems.

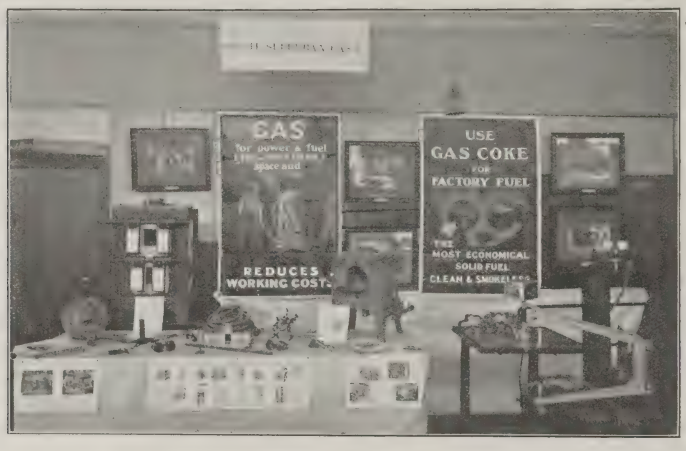
He described his method of mining coal chemically with the aid of sulphur dioxide in substitution for explosives, and referred to the trials carried out in this country and America which had already demonstrated that this reagent could be used underground with absolute safety and without discomfort to the workers. He then showed the importance of the inorganic constituents in the preparation of coal for the market, particularly in coal washing, and foreshadowed an extension of the scope of coal refining beyond the reduction of the ash content to the commercial separation of grades for definite purposes—such as coking, gas-making, smokeless-fuel producing, boiler firing, and domestic use. He referred to the difficulties of commercial sampling, due to the uneven distribution of mineral matter in coal, both as regards percentage and chemical composition. The effect of the ash on the combustion process, its fusibility, and physical properties were next dealt with, and the lecturer sounded a warning that, for the successful development of powdered fuel firing, reduction of the ash must be effected, so as not to substitute a dust menace for the vanishing smoke nuisance.

Dr. Lessing then gave an account of his work on the influence of catalysts on carbonization. With the aid of lantern slides, the results from experiments showing the effect of inorganic addition to sugar, cellulose, and coal were demonstrated; and Dr. Lessing indicated that the present empirical processes of carbonization will have to be modified or replaced by methods allowing the carbonizing equilibrium to be influenced at will towards solid, liquid, or gaseous products.

The lecture was illustrated by experiments, and a great number of specimens of coal ingredients and ashes showing the distribution of mineral matter.

An Invitation.—Members of the Institution of Gas Engineers are invited to attend a meeting on Wednesday, May 6, at 6 p.m., at the Institution of Civil Engineers, when Mr. J. Carnaghan will introduce for discussion "A Standard Code for Tabulating the Results of a Heavy Oil Engine Trial." The chair will be taken by Captain H. Riall Sankey, C.B., C.B.E., Chairman of the Special Committee tabulating the results of Heat-Engine Trials.

CO-OPERATIVE DISPLAY BY JUNIOR ENGINEERS.



SMOKE ABATEMENT.

COAL CONSERVATION.

A good idea comes to us from Dartford, which may be suggestive, from the educational point of view, to junior engineers engaged in different branches of the profession. Organized by the North Kent Section of the Institution of Junior Engineers, a very successful engineering exhibition was held on a recent Saturday, in the dining-hall at the works of Messrs. J. & E. Hall, Ltd., at Dartford. A number of firms, including the South Suburban Gas Company, entered heartily into the co-operative display, and made interesting contributions, as will be indicated presently. Over these the junior engineers in the different branches of the profession lingered, and sought much information from their fellows.

The exhibition was opened by Mr. H. J. Ward, Chairman of Messrs. J. & E. Hall, Ltd. In the course of his remarks, he made it clear that in his opinion the education of the younger members of the engineering profession should receive most careful attention, and that every opportunity should be given them to improve their knowledge, as the future of the engineering industry depended upon the juniors. In his view local exhibitions of this kind were a very great help in stimulating the interest which is so necessary. He also spoke of the loss of British orders to foreign shipyards, but stated that he felt convinced that brighter days were in view.

The following firms contributed exhibits:

Messrs. J. & E. Hall, Ltd.	Refrigerating machinery, machine tools, "Todd" oil fuel burners, &c.
Messrs. Vickers, Ltd. (Dartford)	Shells, bomb carrier for aeroplane, &c.
Messrs. Vickers, Ltd. (Erith)	Machine guns, high-speed twist drills, &c.
Messrs. Vickers, Ltd. (Crayford)	Aero engine (9 cylinder BR), gun parts, &c.
Messrs. Vickers, Ltd. (Creek Works) ...	Specimens of ply wood.
Messrs. Mitchell Bearings, Ltd.	Ball bearings, &c.
Messrs. Heath, Ltd. ...	Optical and surveying instruments.
Messrs. Walker Crosweller	Thermometers, CO_2 recorders, &c.
Messrs. J. C. Beadle ...	Wireless apparatus.
Messrs. Fraser & Chalmers	Turbine parts.
Messrs. Elliott Bros. (London)	Electrical apparatus, voltmeters, &c.
Messrs. Aveling & Porter	Steam steering engine of the rotary-valve type.
Captain J. C. De Wardt	Wireless apparatus.
Marconi & Western Electric Company ...	Wireless apparatus.
Westinghouse Morse Chain Company ...	Model chain drive, &c.
The Swedish General Electric Company ...	Single-phase electric motor.
Pneumatic Plate Tightener Sales Company	Plate tightening gear.
Higham Engineering Company	Speed reduction gear.
Messrs. Johnson & Phillips	Switch boards.
Messrs. Callanders Cable Company ...	Electric cables and insulators.
Messrs. Pitter Gauge Company (Woolwich)	Gauges.
South Suburban Gas Company	Smoke abatement, furnaces, and oxy-coal gas cutting.

The Gas Company's exhibit comprised a stand dealing with smoke abatement and conservation of coal; the exhibits being supplied by the British Commercial Gas Association. The furnaces shown were supplied by Radiation Limited and Messrs. Fletcher Russell & Co. They included open-oven, high-speed steel, and muffle furnaces. There were also shown the Keith-Blackman method of mixture control, and Messrs. Hancocks' oxy-coal gas cutting and welding plant. Demonstrations were given on these, in which keen interest was taken. This exhibit was organized by, and under the charge of, Mr. E. L. Oughton, the Sales Superintendent of the South Suburban Gas Company.

SPENT OXIDE AND SPENT OXIDE BURNERS.

One of a series of papers submitted at a joint meeting on April 7 of the Chemical Engineering Group and the Birmingham Section of the Society of Chemical Industry, was by Mr. P. Parrish, A.I.C., M.I.Chem.E., on "The Combustion of Sulphur Containing Materials in Hand and Mechanical Burners."

The author said there can be no doubt that burners which admit of a continuous feed of sulphur, either in granular form or as molten sulphur, are to be desired from all points of view. Labour costs are reduced appreciably, burner gases of any concentration from 5 to 15 p.ct. can be obtained with uniformity, and the plant to which the burner or set of burners is attached can be operated with clock-like regularity. The efficiency of combustion exceeds 99·5 p.ct. One need not hesitate to instal mechanical sulphur burners, because there is no dust problem such as arises when spent oxide and pyrites are the raw materials. Although the initial cost of hand burners is somewhat less than mechanical burners, labour expenses are heavier, and the same uniformity of conditions cannot be maintained. For oleum plants combustion in mechanical burners is ideal from several points of view.

It is interesting to note that increasing quantities of brimstone are being used in this country, as is revealed by the following figures, which also show the relative importance of the other two principal sources of sulphur dioxide.

Sulphur Containing Materials Used in the United Kingdom.

	1923.		1923-24.
Pyrites	800,000	..	350,000
Spent oxide	110,000	..	148,000
Sulphur	3,000	..	66,000

The table given above indicates that the quantity of spent oxide used in this country has increased by approximately 35 p.ct. during the last decade.

Spent oxide is a complex mixture of a large number of bodies and contains varying quantities of moisture, tar, sulphur, and ferrocyanides. The following analysis, taken from "Cyanogen Compounds," by H. E. Williams, affords an idea of the complexity of the material:

Analysis of Spent Oxide.

	P.Ct.
Free sulphur	44·70
Moisture	17·88
Ferric monohydrate	5·26
Ferrous monohydrate	0·25
Basic ferric sulphate	1·25
Ferric ammonium ferrocyanide	2·80
Ferrosoferric ammonium ferrocyanide	2·50
Ferric pyridic ferrocyanide	1·20
Organic matter, peat fibre	4·68
Tar	1·21
Silica	1·05
Naphthalene	0·72
Pyridine sulphate	0·77
Ammonium sulphate	2·05
Calcium sulphate	0·12
Ferrous sulphate	0·02
Ammonium thiocyanate	1·30
Sulphur otherwise combined	1·33
Organic matter soluble in alkalis (humus)	1·54
Combined water and loss (by diff.)	2·36
	100·00

It is not economical to deal with spent oxide containing less than 40 p.ct. of sulphur. Indeed, buyers usually specify a minimum content as 45 p.ct. of sulphur, and not more than 10 to 12 p.ct. of moisture. Large quantities of material are available containing 50 to 55 p.ct. of tar-free sulphur.

Purification of Coke-Quenching Water.

Quoting from a contemporary, in the section dealing with progress in gas technology, the "American Gas Journal" says that water from coke-quenching apparatus contains notable quantities of hydrogen sulphide and hydrocyanic acid, and may be purified by passing through rough filters containing coke, which retain 85 p.ct. of the acids present. Final treatment with concentrated bleaching powder solution, to which sodium carbonate has been added, is recommended. The amount of bleaching powder required may be determined by adding 3 or 4 drops of a sulphuric acid solution of indigo-carmine to 200 c.c. of the water, and titrating with alkali hypochlorite solution until the blue colour disappears.

Midland Association of Gas Engineers and Managers.—The spring general meeting of the Association will be held at Oxford on Thursday, May 7.

Institution of Gas Engineers.—The Right Hon. Sir Philip Cunliffe-Lister, K.B.E., M.C., M.P., President of the Board of Trade, has accepted an invitation to luncheon with the Institution of Gas Engineers, at the Royal Automobile Club, on Wednesday, June 10 next.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

The portion of the proceedings at the Spring Meeting of the Association in Edinburgh which was given in last week's "Journal" included two papers on the subject of maintenance —one by Mr. J. W. Napier and the other by Mr. George Keillor. Interposed between these was an address by Mr. J. W. M'Lusky, of Glasgow, on the same subject. A report of this follows.

MR. M'LUSKY ON MAINTENANCE.

Mr. M'Lusky said many gas managers to-day were losing business, and many were destined to lose business, because they had not yet realized that they were not doing half enough for the gas consumer. Generally speaking, the conditions found in the trial district in Glasgow were, in a more or less degree, applicable to the other districts. Whether or not it was from fear of being charged excessively for repairs to gas appliances and piping, some consumers seemed quite content to jog along with any makeshift. This question of makeshift fittings had been brought home to them very forcibly in Glasgow as the outcome of practical experience. Frankly, they did not know anything like one-half of the situation until they went out in the city to investigate and explore. Indeed, he was so impressed with what had been discovered that he wanted to ask his brother gas managers if they were familiar with the actual conditions in their own particular districts. Just by way of challenge, he desired to ask them how much more they knew about each house of their own district since last September, when he submitted a report as to what was then being done in Glasgow.

Going over some of the districts that were being maintained, and seeing the condition of piping—especially in the poorer and business parts of the city—one did not really wonder at Mr. Butterfield's warning in his report to the Board of Trade. Indeed, in order to emphasize this point, he had that day brought with him a few typical examples of what had been discovered. In a large factory using high-pressure gas, which was visited in the course of maintenance, complaint was made of very poor lighting and big gas accounts. The complaint of poor lighting was justifiable from the illumination provided—scarcely one burner was in proper order—and the firm were considering the question of changing over to another form of lighting. Maintenance fitters were soon on the job; and when the overhaul had been completed, the remark was made that the firm had not had such splendid lighting for years. The trouble in this case was that whoever had the work of annually overhauling the system did not seem to understand the type of burner, and in almost every case the injector hole had been enlarged to nearly six times its original diameter. For the inspection of his colleagues, he had brought with him a specimen of the injector used. That was only one instance of trouble with high-pressure gas. So far, in Glasgow, they had dealt with fifteen installations; and the results had been satisfactory.

Then he proposed exhibiting at this stage a piece of compo piping with about a foot of red indiarubber tubing tied to it. This was cut from a gas supply to a bracket in a bedroom where an old lady had been lying ill for years. It was found behind the window-shutter, where the supply pipe was running. The old lady said she always noticed a smell of gas. There was a bad leak; and the patient had certainly little chance of recovering while this piping was in use. Then he produced another contraption which was supplying a gas ring. It was a piece of compo piping to which was attached a bit of asbestos and rubber tubing, on which a Glasgow Gas Department crane was fixed. There was connected to this again a piece of flexible metallic tubing. Again, there was a specimen of a ¼-in. crane fixed to a piece of ⅜-in. compo piping by means of a cloth wrapping. These, he might point out for the information of the meeting, were only a few cases out of hundreds dealt with.

Proceeding, Mr. M'Lusky explained that between the month of June last and the end of February of the present year—during two months of that period maintenance was suspended —no fewer than 2300 consumers in the city of Glasgow were requested by maintenance fitters to call-in plumbers to deal with escapes of gas in private pipes. When a maintenance fitter found an escape of gas in private piping, he requested the consumer to call-in a plumber. At the same time he recorded this fact on a card provided for the purpose. The arrangement was that the inspector should call on the consumer within a week, and inquire if the escape had been duly attended to. If not, an appeal was again made to the consumer to summon a private plumber.

The radiator, though one of the most serviceable gas-heating appliances, was also one which had more abusive language showered on it than any other gas-heating agent; and yet the appliance was not to blame. In Glasgow their experience of radiators which had been fitted by maintenance men was that in nearly every case the apparatus had been entirely neglected. Some of them were even allowed to burn day after day without having a drop of water added. Of course, this sort of thing was bound to result in defective loops and inoperative

diaphragms. The automatic check action regulating the gas supply was rendered useless, with the result that big gas accounts were incurred. In Glasgow all hired radiators were thoroughly overhauled a year ago, and when met with during maintenance private radiators had been dealt with. During the past winter, in order to ensure that these appliances were efficient, a squad of men had been constantly employed watering and reporting defects, with the result that this most useful appliance had come into its own. The piece of sheet iron, shaped like a diaphragm, which he held in his hand, was what they had met with repeatedly in radiators. Leather and zinc were also found in use. The poor appliance was often blamed by the consumer, and yet the private tradesman had rendered his account and drawn his money for repairing it A small piece of glass tube which he exhibited represented part of an alleged gauge glass tube from a radiator. It was a piece of glass tube for a baby's feeding bottle. Gas fires of antiquated design were met with regularly; and it was only by a system of maintenance that consumers could be shown the disadvantages of their use. Old-type gas fires were, therefore, gradually being eliminated.

In regard to gas lighting burners, fitters and inspectors alike reported on the general satisfaction of consumers once lighting burners had been overhauled. Of course, in certain cases, burners were past useful service and repair, and sometimes the service of the maintenance fitter did not show any improvement. Maintenance had, however, brought before them in Glasgow the fact that, had the system been in vogue ten or fifteen years ago, they would to-day be counting among their lighting consumers many who introduced other lighting agents because of unsatisfactory illumination from their gas burners. To-day, in Glasgow, they were holding consumers who, but for the introduction of the maintenance service, would have been lost to the industry. They realized, when on maintenance, that every factory, workshop, hall, church, school, and public institution had not gone over to electricity; and by their efforts they expected to see gas retained wherever it was now used. It might be said that it was a costly business to replace globes and gas mantles broken by maintenance fitters; but the experience in Glasgow showed that it represented a small item. The number of lighting appliances overhauled between June, 1924, and January, 1925, was 317,845. During this period, the number of mantles and globes broken and replaced was: Gas mantles, 449, equal to 0·14 p.ct. of burners; and globes, 52, equal to 0·016 p.ct. of burners. Further experience had shown that maintenance fitters made good salesmen—from June, 1924, to January, 1925, no fewer than 2631 orders were taken for cooking, heating, and lighting appliances.

Mr. M'Lusky said that, on the question of expenditure, he was now in a position to give some interesting figures. When he reported first of all to his Committee on the Glasgow trial scheme, the figure of 1¾d. per 1000 c.ft. was mentioned. He was told that it could not be done for that, but eventually he was tied-down to 1¾d. Of course, it might be said that officials could produce figures to prove anything; but he would remind them that a balance-sheet was, after all, a balance-sheet. Experience showed that, after a certain period, they were able to report to the Committee that the cost was about 1¾d. per 1000 c.ft. The latest figures, however, revealed the cost as being 0·592d., or just over a halfpenny, per 1000 c.ft. Sometimes he did feel he was a brave man, and imagined he could start a good business in Scotland, and actually make a fortune, if he set out to maintain gas appliances at 1d. per 1000 c.ft. If he spent a halfpenny to make a halfpenny, this surely was good business. The cost per appliance for labour was 4·46d.; for material, 1d.; and overhead charges, 1·58d.—making 7·04d. per appliance. The details applicable to the cost per 1000 c.ft. were: Labour, 0·375d.; material, 0·084d.; and overhead charges, 0·133d.—giving a total of 0·592d. Applicable to the cost per therm made, the details were: Labour, 0·080d.; material, 0·018d.; and overhead charges, 0·028d.—a total of 0·126d.

These were marvellous figures, and the gas industry in Scotland had to admit it. In Glasgow they estimated that they had 1,250,000 appliances contained in 213,447 premises. They were at the moment maintaining 995,038 burners and appliances. In September last he reported that there were being maintained 410,000 appliances, so that in the past six months they had increased 140 p.ct. By so doing, they had reduced the expenditure from 1¾d. per 1000 c.ft. to 0·592d. In these figures he thought there was sufficient to show that, the bigger the maintenance scheme became, the cheaper it got. If fitters broke mantles or globes in the course of their examination, these were replaced. Since the Glasgow scheme was inaugurated, the percentage of broken mantles was 0·14, and the percentage of broken globes 0·016.

In conclusion, Mr. M'Lusky urged upon every member of the Scottish gas industry the importance of bringing this question of maintenance before company and corporation in some shape or form. If it was not practicable to get a whole town mapped-out on a scheme of maintenance, it might be feasible to experiment on a particular area or on a municipal ward. Something, however, ought to be done to drive home the thin end of the wedge, and there should be a general insistence on the policy that the gas industry in the future was not going to proceed on the old lines.

[The report of the ensuing discussion will be published next week.]

CAUSE OF LONDON FOGS.

A paper on "Modern Atmospheric Conditions," with special reference to London, was read recently before the Royal Society of Arts by Dr. J. S. Owens (Superintendent to the Advisory Committee on Atmospheric Pollution, Air Ministry), in which he advanced a new explanation of the cause of smoke fogs. He pointed out that during a thick smoke haze, and assuming an upper limit of 300 to 400 ft., there would be something like 200 to 250 tons of soot suspended over London. Further, the whole of this soot can be produced in about three hours by the fires lighted on a winter's morning. Thus, if Nature's provision for scavenging fails for a few hours, there is ample material for a dense smoke haze. The popular conception of such a condition in London is that there must first be a water fog, and that the globules of water are condensed around smoke particles, while the outer surface of such globules becomes coated with a film of tarry oil, which is supposed to account for their failure to disappear by evaporation, although the air may not be saturated. This, Dr. Owens believes, is an entire misconception; and therefore he put forward, as a more satisfactory explanation, and more in accordance with the facts, the theory that the "London Particular" is caused by a more or less complete replacement of water particles by smoke particles; the water droplets being partially evaporated by the higher temperature, and their place taken by smoke. In support of this view, he quoted various observations; adding that the bearing of this contention upon prevention is evident, since one is driven to the conclusion that, if smoke were not supplied to take the place of the water, London would be more free from fog than its surroundings.

THE HONLEY SPIRAL-GUIDED HOLDER.

PRESENT AT THE INAUGURATION

In last week's "Journal" a report was given of the proceedings at the inauguration of the spiral-guided gasholder at Honley. The above photograph of those present at the official "turning-on" of the gas by the Chairman of the District Council (Mr. G. T. Oldham, J.P.) came to hand too late to include with the report.

ELECTRIC POWER PLANT FOR GAS-WORKS.

Operating Dynamos in Parallel.

By Hugh P. Vowles, M.I.Mech.E., M.A.Min.E.E.

Introductory.

The writer has had twenty-five years' experience in the manufacture, installation, and operation of electric power plant, including several years on a large gas-works. These notes have been compiled in the hope that they will provide some guidance for those who, faced with the question of installing such plant, have had little time or opportunity to acquire the knowledge necessary to ensure the work being carried out satisfactorily. Let it be stated at once that it is not sufficient to rely entirely upon power plant contractors for guidance. The reasons for this statement will be made clear.

A greater diversity of technical knowledge is required on a gas-works than perhaps in any other branch of the engineering profession. It is necessary to have not only civil and mechanical engineering knowledge; one must be something of a chemist as well. It is only natural, therefore, that, with such a wide range of knowledge already required, many gas-works engineers should feel the need of enlightenment concerning the problems peculiar to electrical power plant. They realize that electricity will be used more and more on modern gas-works for such purposes as the operation of retort stoking machinery and telphers, and the driving of exhausters, scrubbers, pumps, and other plant. The difficulty is to select just that portion of electrical engineering data which will meet their needs without involving an exhaustive study, taking up time which cannot well be spared from other matters. To meet this requirement, the writer proposes to deal only with those electrical details which are of immediate practical gas-works interest. A bare knowledge of elementary electrical principles will be assumed, but beyond this the ground will be covered as fully as the scope of a necessarily brief article allows.

It may be noted here that, so long as only one generating unit is installed, the procedure to be adopted is simple. Given a reliable contractor, little difficulty need be anticipated. It is when further units have to be installed, and the works engineer wishes to be independent of any particular contractor, that his troubles are likely to begin if knowledge is lacking.

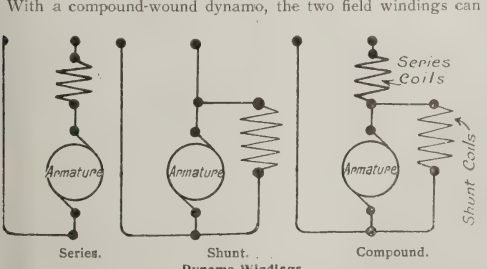
The only type of electric generating plant suitable for the average gas-works is the direct-current, compound-wound dynamo, driven either by steam or gas engine. In order that efficiency or economy shall not be sacrificed, such dynamos must be operated "in parallel." It will be convenient to lead up to a consideration of parallel operation with a few definitions.

Definitions.

Electric windings (as on a dynamo) are said to be "in series" when the end of one is electrically connected to the beginning of another, so as to form one continuous path for an electric current. Such windings are said to be "in parallel" when they provide two or more branch paths for an electric current; the current dividing and afterwards re-uniting at the point where the branches meet. Any branch which serves as a by-pass to another is called a "shunt."

There are three methods of winding direct-current dynamos—"series," "shunt," and "compound." A series-wound dynamo is one in which the field winding is in series with the armature winding and the main external circuit. A shunt-wound dynamo is one in which the field winding forms a by-pass or shunt to the main circuit. A compound-wound dynamo is one in which there are two sets of field windings, one in series with, and the other forming a shunt to, the main circuit.

With a series-wound dynamo running at constant speed, the voltage rises as the current output increases. With a shunt-wound dynamo, the voltage drops as the current increases. With a compound-wound dynamo, the two field windings can



Dynamo Windings.

be proportioned so as to compensate for each other, ensuring constant voltage at all loads, providing speed is constant. Such a dynamo is said to be "level-compounded."

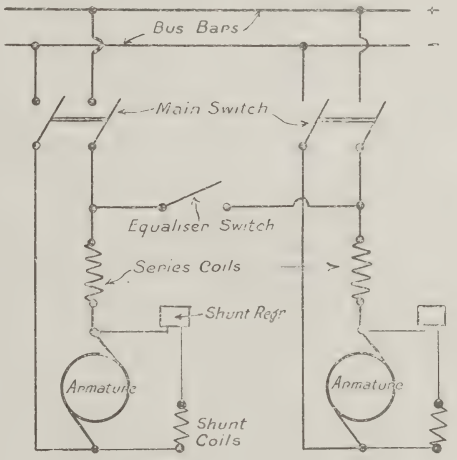
Although constant voltage at all loads is the ideal for normal conditions, some makers design their dynamo windings so as to give a slight rise in voltage, and other makers so as to give a slight drop in voltage, as the load increases. The one design of dynamo is said to be "over-compounded," and the other "under-compounded."

Compound-wound dynamos which differ thus in the degree of compounding will not run satisfactorily in parallel. "Running in parallel" implies that the dynamos are electrically connected by joining like terminals to form a common positive and a common negative terminal. This arrangement results in a combined voltage which is the same as that of any one machine; but the current available at the common pair of terminals is equal to the sum of the individual capacities of all the machines so connected.

Parallel Running.

Dynamos being designed to give greatest efficiency under full-load conditions, full economy of operation can only be obtained when each dynamo is worked as much as possible at its maximum output. If, instead of running in parallel, each dynamo feeds separate sections of a gas-works without electric interconnection, it is possible that several dynamos will each be running only partially loaded. There may not be sufficient load on any one circuit to load its particular dynamo fully. This means inefficient operation, while standing charges are the same for both efficient and inefficient operation. If, on the other hand, all dynamos are connected in parallel, then one may be started-up and fully loaded from any or all of the external circuits. If the total load increases, another dynamo can be switched in, and so on; no dynamos being used until those already running are fully loaded, and therefore working at maximum efficiency.

The ratio of the actual electric energy consumed to that which would be consumed with a continuous maximum demand is called the "load factor." A 100 p.ct. load factor represents maximum efficiency; and the economy to be secured by parallel running may be illustrated by the statement that in the case of



Compound Dynamos in Parallel.

small electric generating sets (say, 50 to 100 kw. capacity), the relative costs per kilowatt per hour at 100 and 25 p.ct. load factors are approximately in the proportion of 100 to 260.

Plant Specification.

It will be clear from the foregoing that when supplementary generating sets are being ordered, it is essential to see that these are designed to operate in parallel with those already installed. Unless this is clearly stated in the works engineer's specification, the contractors cannot be blamed for offering their standard makes of dynamo, which may or may not be suitable. It is thus not sufficient merely to specify the voltage. Assuming that the tender of a new contractor is more favourable in regard to price, delivery, &c., the engineer will naturally desire to feel free to select this particular make. This he can safely do if he covers the question of parallel running in his specification.

Let us assume that this is not done, and a new dynamo is supplied with a degree of compounding different from one already in use. Suppose the existing machine is under-compounded, the new one over-compounded. What will happen when these machines are coupled in parallel? For the sake of convenience we will call the dynamos "A" and "B." Dynamo "A," being under-compounded, will give a voltage which drops as the load increases. Dynamo "B," on the other hand, will give an increased voltage at the higher loads. "B" will therefore tend to take more than its due proportion of load, causing a still greater discrepancy in voltage; and so on progressively, until all the load is thrown on to this machine. In the end machine "B" may overpower, and send a reverse cur-

rent through the armature of "A," tending to drive it as a motor. Damage may ensue, resulting in serious electrical breakdown.

Even when this risk is guarded against in the specification as indicated above, and the machines are designed for parallel running, there is still a possibility of varying speeds giving rise to varying voltages. This is why engines driving dynamos should be equipped with governors giving very close speed regulation; and this also should be indicated in the specification.

As a further precaution, it is usual to specify that the switchgear shall include "automatic circuit breakers with no-volt and overload release." Any drop in voltage, or any undue increase of load, will then result in the circuit breaker automatically opening the circuit and so preventing damage.

Actual Operation.

Assuming, now, that the various precautions indicated here have been taken, and that the dynamos are designed and equipped with suitable switchgear for parallel running, there remains only the actual procedure for putting the machines into operation together. They are connected electrically through switches to common terminals on the back of the switchboard called "bus-bars," from which feeders supply the external circuits on the gas-works. An "equalizing switch" is also provided, joining the extremities of the fixed windings (at the dynamo brushes) in parallel. The object of this is to ensure that the current to the common external circuit shall flow in the same direction through each series winding with equal magnetizing effect on the two fields. Then, in order to switch-in the second dynamo, it must first be run until its voltage is approximately the same as that of the machine already on load. Then, and not until then, the equalizing switch may be closed, followed by the closing of the switch linking the machine to the bus-bars.

To cut-out any one dynamo, first reduce its speed slightly until it is supplying very little current, open the main switch, and finally the equalizing switch.

An alternative arrangement, involving a little more expense, is to have the switchboard provided with a third, or equalizer, bus-bar. In this case three connections are taken from each dynamo to the switchboard; and the sequence of operations indicated above is taken care of automatically by specially designed triple-pole switches, with a delayed contact for the equalizer pole on each switch.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

Annual Meeting.

The Annual Meeting of the Association was held at the Grand Hotel, Manchester, on April 4—Mr. H. E. Stone (Birkenhead) presiding.

The report was formally approved, after being read by the Hon. Secretary (Mr. J. Alsop). The number of members on the books last year was 217. Since then 18 have been enrolled, 4 have resigned, 10 have ceased to be members by operation of rule 4, 3 have left the district, and there have been 3 deaths; leaving the membership at 215—a decrease of 2.

The Council have elected the Past-President of the Institution of Gas Engineers, Mr. S. Tagg, an Hon. Member of the Association, in recognition of the valuable services he has rendered during his long membership.

The Secretary read a letter from the Institution of Gas Engineers relative to the employment register.

The President presented the prizes for papers read during the session. The awards were given to Mr. W. B. Payne, of Liverpool, and Mr. A. D. Young, of Burnley.

The rule relative to associate membership, passed in 1922, was deleted from the books.

Mr. Stone, the outgoing President, introduced the President-Elect, Mr. J. T. Haynes, of Bolton.

Mr. Haynes moved a vote of thanks to Mr. Stone for his services as President, and presented to him, on behalf of the Council, a certificate on parchment, as a reminder of his presidential year.

Election of Officers for 1925-6.

Junior Vice-President—Mr. W. H. Battersby (Bury).
Hon. Secretary—Mr. J. Alsop (Bolton).
Hon. Treasurer—Mr. I. H. Massey (Oldham).
Auditor—Mr. F. A. Collier (Oldham).
Members of the Council—Messrs. Hailstone (Rochdale), Livesey (Stretford), H. B. Knowles (Lancaster), Young (Burnley), and Prince (Heywood).

After the meeting, the members had dinner together.

The guests of the evening were Messrs. L. Lees (Chairman of the Birkenhead Gas Department), A. L. Holton (Manchester), J. W. Scott (Messrs. R. & J. Dempster, Ltd.), Marsden (National Gas Engine Company, Ltd.), Gillett (President of the Yorkshire Junior Gas Association, and Horwill (Hon. Secretary of the Yorkshire Juniors).

UTILIZATION OF WASTE HEAT FROM COKE OVENS.

[Extracts from a Paper read by Dr. A. Parker at a Meeting of the Coke Oven Managers' Association (Midland Section) on Feb. 28.]

It is assumed that the coal carbonized contains 30 p.ct. of volatile matter, and Table I. gives the average yield of products when this coal is carbonized in waste-heat, recuperative, and regenerative ovens.

Table I.—*Results per Ton of Coal.*

Coke made	14 cwt.
Temperature of coke as discharged	1000° C.
Gas made (debenzolized, saturated at N.T.P.)	11,000 c.ft.
Calorific value, gross	500 B.Th.U. per c.ft.
,, ,, net	440 ,, ,, ,,
Composition by volume—	P.Ct.
CO_2	2·5
C_nH_m	2·0
O_2	0·5
CO	6·0
H_2	53·0
CH_4	27·0
N_2	9·0
	100·0

Type of Oven	Waste Heat.	Recuperative.	Regenerative.
Fuel gas used, c.ft.	9000	7000	5500
Surplus gas available, c.ft.	2000	4000	5500
Temperature of waste gas, ° C.	1100	700	300

Dry Cooling of Coke for Steam Raising—Sulzer Process.

The mean value of the specific heat of coke between 200° and 1000° C. is approximately 0·39. The heat lost by 1 ton of coke in cooling from 1000° to 200° C. is therefore 1,258,000 B.Th.U., which would be sufficient to raise 1296 lbs. of steam from and at 100° C. In practice a certain amount of heat is lost by radiation and convection and in heating-up the circulation gas from ordinary temperature to that at which it finally leaves the boiler. On the other hand, some heat is developed by the combustion of the air with a small fraction of the coke when it first enters the cooler. Tests carried out on the Sulzer plant installed at the Keilehaven Gas-Works and at Schlieren have yielded results which are equivalent to evaporations from and at 100° C. of from 1060 to 1250 lbs. per ton of coke. The proprietors of the process have guaranteed 740 lbs. of steam at 100 lbs. pressure from water at 15° C., which is equivalent to 884 lbs. from and at 100° C. Accepting this figure of 740 lbs., the amount of steam which could be raised at 100 lbs. pressure from 14 cwt. of coke is 518 lbs. Assuming that in the production of electrical energy the consumption of steam per kilowatt hour is 25 lbs. at 100 lbs. pressure, then 518 lbs. would generate 20·7 kw. The fan power required on the Sulzer plant at the Keilehaven Works was 20 kw., and the amount of coke treated was 6 tons per hour, so that in the same proportion a deduction of 2·3 kw. must be made from the 20·7 kw., leaving 18·4 kw. as the net energy available. The net energy which may be recovered by cooling 14 cwt. of coke from 1000° C. to 200° C. may therefore be expressed as 460 lbs. of steam at 100 lbs. pressure, or 18·4 kw.

Steam Raising by Surplus Gas.

With boilers specially designed for firing with gaseous fuel, an efficiency of 80 p.ct. of the net value of the fuel should be attainable in practice.

The net calorific value of the coke-oven gas is 440 B.Th.U. per c.ft. With a thermal efficiency of 80 p.ct. and a consumption of 1000 c.ft., 352,000 B.Th.U. would thus be utilized in raising steam. The amount of steam which could be raised at 100 lbs. pressure from water at 15° C. would therefore be 303 lbs. Calculated on this basis of 303 lbs. of steam per 1000 c.ft. of gas burned under the boiler, the amounts of steam which should be raised from the surplus gas from the carbonization of 1 ton of coal in the different types of ovens, are given in Table II.

Table II.—*Amounts of Steam from Surplus Gas.*

Type of Oven	Waste Heat.	Recuperative.	Regenerative.
Surplus gas from 1 ton of coal, c.ft.	2000	4000	5500
Steam at 100 lbs. from water at 15° C., lbs.	606	1212	1666
Electrical energy in kilowatt hours (basis 25 lbs. of steam)	24·2	48·5	66·6

Surplus Gas and Gas Engines.

The brake thermal efficiency of an ordinary modern gas engine working at three-quarter load is 25 p.ct., and at one-third load 20 p.ct., calculated on the net calorific value of the gas. (*Vide* Clerk, Smithells, Cobb Report to the Institution of

Gas Engineers, 1919.) For the purpose of deducing modest estimates of the power which should be developed by the use of surplus coke-oven gas in gas engines, it is therefore assumed that the thermal efficiency is 20 p.ct. on the net calorific value. The net thermal value of the coke-oven gas considered in Table II. is 440 B.Th.U. per c.ft., so that, of the heat value of 1,000 c.ft., 88,000 B.Th.U. would be converted into power. Since 1 B.H.P.-hour is equivalent to 2545 B.Th.U., 1000 c.ft. of gas would develop 34·6 B.H.P. The power developed by the surplus gas from the three types of coke oven would therefore be as given in Table III.

TABLE III.—*Surplus Gas and Gas Engines*

Type of Oven	Waste Heat.	Recuperative.	Regenerative.
Surplus gas from 1 ton of coal, c.ft.	2000	4000	5500
Power developed by gas engines, B.H.P.	69·2	138 4	190·3
Kilowatt-hour equivalent (90 p.ct. generator efficiency)	46·4	92 9	127·7

EXHAUST-HEATED BOILERS AND GAS-ENGINE PLANT.

It is generally recognized that, even with modern internal combustion engines, approximately 40 p.ct. of the heat of the fuel is carried away through the exhaust pipe. From trials which have been carried out (*vide* I.C.F. Statham, Institution of Mining Engineers, Nov. 19, 1924), it appears that, with properly-designed boilers, about 2 lbs. of steam from and at 100° C. may be raised from the exhaust gases of a gas engine per B.H.P.-hour developed. It is not usually recommended that this method of heat recovery should be employed with engines of less than 100 H.P. Gas engines utilizing surplus gas from coke-ovens would, however, generally be of much larger capacity. Accepting the figure of 2 lbs. of steam from and at 100° C. per B.H.P.-hour, then the amounts of steam which could be raised in this manner from the three types of oven are as shown in Table IV.

TABLE IV.—*Exhaust-Heated Boilers and Gas-Engine Plant. Results per Ton of Coal Carbonized.*

Type of Oven	Waste Heat.	Recuperative.	Regenerative.
Steam at 100 lbs. from water at 15° C. from gas-engine exhaust gases, lbs.	115	231	318
Electrical energy in kilowatt hours	4·6	9·2	12·7

WASTE GASES AND STEAM RAISING.

For the complete combustion of 100 volumes of the fuel gas the composition of which is given in Table I., the theoretical amount of air required is 442 volumes; and the volume of the product gases when reduced to 15·5° C. and 30 in. mercury and saturated with water vapour, would be 400·5 volumes. If it be assumed that the combustion would be so regulated in practice that 541·5 volumes of air would be used, the comparative amount of the waste gases would be 500 volumes at

TABLE V.—*Waste Gases and Steam Raising.*

Type of Oven	Waste Heat.	Recuperative.	Regenerative.
(1) Fuel gas used, c.ft.	9,000	7,000	5,500
(2) Volume of waste gas leaving installation (reduced to 15·5° C., 30 in. saturated), c.ft.	45,000	35,000	27,500
(3) Weight of water vapour accompanying waste gas, lbs.	504	392	308
(4) Temperature of waste gas leaving installation, °C.	1,100	700	300
(5) * Sensible heat of waste gas and water vapour, therms	27·64	14·96	6·85
(6) * Heat value of waste gas entering boiler, therms	25·43	14·21	6·71
(7) Volume of waste gas entering boiler (reduced to 15·5° C. and 30 in. saturated), c.ft.	58,500	45,500	35,750
(8) Composition of waste gas at inlet of boiler: Volumes p.ct. CO_2	6·4	6·4	6·4
O_2	8·0	8·0	8·0
N_2	85·6	85·6	85·6
	100 0	100·0	100·0
(9) Temperature of gases at inlet of boiler, °C	821	534	236
(10) Temperature of gases at outlet of boiler, °C.	250	250	..
(11) * Heat value of gases at outlet of boiler, therms	11·34	8·82	..
(12) Heat available for raising steam, therms (gross)	14·09	5·39	..
(13) Heat available for raising net steam, due allowance being made for fan power, &c., therms	13·10	5·01	..
(14) Net steam at 100 lbs., from water at 15° C., lbs.	1,129	432	..
(15) Electrical energy in kilowatt hours (25 lbs. of steam per kilowatt hour)	45·2	17·3	..

* The heat values include the latent heat of water.

the points at which the products leave the battery of ovens. The composition of the waste gas would then be represented by 8·3 p.ct. of CO_2 and 4·2 p.ct. of oxygen; in addition, the water vapour carried by the fuel gas and air, and resulting from the combustion of the fuel gas, must be taken into account.

Combining the data given in the first four items of Table V. with the specific heat values given in Partington and Schilling's "Specific Heats of Gases," and calculating from a base line of zero Centigrade, the heat values in item (5) of Table V. are obtained. In practice it is found that during the passage of waste gases from settings of retorts or ovens to waste-heat boilers, large volumes of air leak into the flues, with the result that there is a considerable lowering of temperature. For the purpose of these calculations, it has been assumed that the amount of air infiltration is 150 volumes for every 500 volumes of waste gas. A certain proportion of heat is also lost by radiation and convection from the flues leading from the installation to the boiler. These heat losses have been assumed to be 8 p.ct., 5 p.ct., and 2 p.ct. of the heat values of the waste gases respectively for the three types of oven. These assumptions are necessarily approximate, since the actual losses vary with different installations. After making the necessary allowances for air infiltration and heat losses from the flues, the figures given in items (6), (7), (8), and (9) are obtained.

SUMMARY.

Waste Heat from Coke Ovens.

Type of Oven	Waste Heat.	Recuperative.	Regenerative.
Total energy in kilowatt hours per ton of coal (all waste heat used for raising steam)	87·8	84·2	85·0
Total energy in kilowatt hours per ton of coal (surplus gas used in gas engines—the exhaust gases being passed through a waste-heat boiler—other waste heat used for steam raising)	114 6	137·8	158·8

Whether waste-heat recovery should be practised by all or any of the methods considered, states Dr. Parker, is a question the answer to which must depend on how far the energy developed can be profitably used.

BRITISH ASSOCIATION OF CHEMISTS.

On Friday, April 3, Dr. E. F. ARMSTRONG, the President of the British Association of Chemists, addressed a meeting of the Birmingham Section of that body at the Queen's Hotel. Members were present from the Society of Chemical Industry, the Institute of Chemistry, and the Chemical Society.

Dr. Armstrong spoke on "The Profession of Chemistry; What Can we Make of it?" There was need, he said, in this democratic age, that chemists should take stock of their position; and he believed, when this was done, it would be realized that an organization fuller, and with a broader scope, than anything now existing would be necessary to provide for the various grades of men who might fairly claim to represent the profession of chemistry. He was strongly of opinion that there was no need for the present multiplicity of societies and organizations, each of which was supposed to represent some particular interest. In view of the fact that there were a number of societies in the chemistry profession, he would like to preach the philosophy of the "middle-way" among chemists. One of their troubles was that no one understood them. They could never be what they thought they were unless someone really admired them. Their mission should be to make the nation understand what chemistry was; what it had done; and what it was doing. There was need for new propaganda methods.

Some of them had done their best to bring together societies catering for the interests of various sections of chemists; but such a movement would only succeed when it came from the mass of the members. If it came from the bottom upwards, and there was insistence that the societies should combine, then chemistry would achieve something. What was wanted was a register of chemists, and a central home for chemists in London to start with, and later on, if they could get them, homes in provincial centres. A third ideal was that they ought to have one journal. Everybody who reached a certain attainment in chemistry ought to be registered as a chemist; and this attainment could be measured in a number of ways. He did not see any difficulty in setting-up such a register; and then they would have one body qualified to speak for all chemists. The management would probably present difficulties. One scheme might be that each class would have its own council or committee, and be represented on a basis proportional to the number of the members on a central council. Such a body would be a proper one to watch over the benevolent side of the chemical profession, as well as over professional interests.

If all chemists were one big body like this, one of the duties

would be to promote the cause of chemistry. It would have its scientific group for promoting pure research, as now represented by the Chemical Society. It would have its industrial group, holding meetings for the reading and discussion of papers on applied chemistry. Thus they would be doing work now undertaken by the Society of Chemical Industry. Finally, there could be a third group, interested in the application of engineering to chemistry—a function which was partly filled by the so-called Engineering Group, and the so-called Group of Chemical Engineers. Thus would these become groups of one body, which should be in a position to speak for all chemists on all occasions.

FURNACE DESIGN AND PERFORMANCE.

[Extracts from a Paper by T. R. Speck, of the B.S.A. Company.]

It is interesting to have the views of an actual user of gas furnaces. These are expressed in a paper read before the Birmingham Association of Mechanical Engineers by Mr. T. R. Speck, of the Birmingham Small Arms Company. After stating that gas-fired furnaces are deservedly the most popular in the Birmingham district, the author goes on to consider

Thermal Efficiency.

The thermal efficiency of a furnace may be represented as follows:

Total heat content in B.Th.U. in material leaving furnace, *minus* initial heat content in B.Th.U. on entering furnace, multiplied by 100, and divided by the gross B.Th.U. content of the fuel consumed during the heating of the material.

Let W = weight of metal in lbs.
T_1 = initial temperature of metal, ° Fahr.
T_2 = final ,, ,, ,, ° Fahr.
S = specific heat ,, ,,

$$\text{Then } \frac{(W \times S \times T_2) - (W \times S \times T_1)\ 100}{\text{Total B.Th.U. value of fuel used}} = \text{thermal efficiency.}$$

The specific heat of metals varies at different temperatures, and for mild steel from zero to melting-point is about 0·160 to 0·165. This figure, though not strictly correct, will give reasonable accuracy for ordinary annealing and hardening temperatures. There does not appear to be any information available as to the effect of the introduction of nickel, chromium, &c., on the specific heat of steels.

The lower curve B on fig. 1 shows the B.Th.U. content in 1 lb. of 0·30 carbon steel at various temperatures. The correct specific heat figures for the different temperatures (as given by Meuthen) have been used. The straight line indicates the amount of error produced by using the mean figure of 0·160. The upper curve gives the thermal efficiency of a furnace fired by gas of a calorific value of 480 B.Th.U. gross, when 1 lb. of steel is raised by 1 c.ft. of gas to the various temperatures shown. The initial temperature of the steel has been assumed as 62° Fahr. in all cases. To find the efficiency when different quantities of gas are used per lb. of steel heated, divide the percentage efficiency shown by curve A by the number of cubic feet used. The above curves will be found very useful in going into the question of furnace economy. Thermal efficiency is one of the readiest means of comparing the performance of different furnaces. There are, of course, other factors that count, such as even temperature distribution, &c.

Need for Standardized Tests.

When selecting a furnace for a particular job, it is difficult to find out exactly what the fuel consumption is going to be under stated conditions. Some makers base their estimates on gas consumed per pound of metal heated; others appear per the superficial area of the furnace chamber—a figure which may vary from 10 to 15 c.ft. of gas per sq. ft. at temperatures from 800° to 900° C. The latter method may be reasonably correct for some furnace loads, but varies considerably with different weights and nature of load. It would be of great assistance to the furnace buyer if some standardized form of test could be adopted for each class of furnace. He would then be able to satisfy himself as to the relative merits of various machines offered, and price would only affect the issue in so far as value for money was concerned. A recognized test of this description could also be a guide to the engineer, helping him to decide on the economic life of the furnace linings, &c. In any form of standardized test, thermal efficiency should be given a prominent place, as also should the fuel consumption required to maintain a definite temperature with the furnace empty.

The chief use of the thermal efficiency figure is for purposes of comparison. If the machines are required for general purpose work, it will be a good guide as to which furnace is likely to prove most economical—always assuming that the size and the general design are suitable for the work. There are many reasons why the true thermal efficiency cannot often be obtained in practice—for example, scale or grease on the work may affect the rate of absorption; and work in pots can be heated much quicker if suitably distributed throughout the furnace than if packed together in a heap. It will be readily realized that a hundredweight of steel in billet form will absorb the same number of B.Th.U. on being heated from (say) 600° to 900° as will a hundredweight of thin coil springs; but as the latter offer far more surface area for the absorption of heat, it follows that, with the furnace at the same temperature, they reach the temperature required in much less time than the billet, while the radiation, flue, and other losses, which in most furnaces represent over 60 p.ct. of the heat generated, are more in proportion to the time taken for the operation. Carburizing work in pots shows up even worse than the billets; for, not only is the work well insulated by the carburizing material in the pots, but, after it has reached the proper tem-

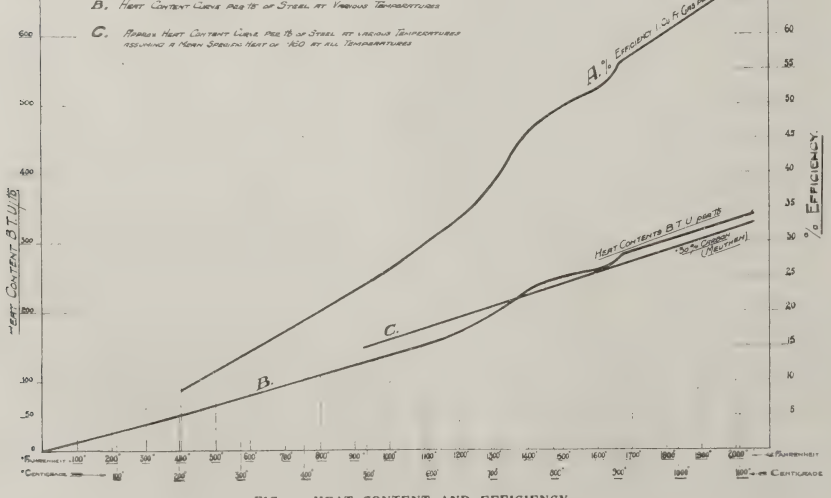

A. Furnace Efficiency Curve when 1 Cu. Ft. of Gas at 480 B.T.U. Gross is used to heat 1 lb. of Steel to Various Temperatures Initial Temperature of Steel assumed at 65°F. For other gas consumptions divide efficiency (%) by gas consumed per lb. of Total Heated
B. Heat Content Curve per lb. of Steel at Various Temperatures
C. Apparent Heat Content Curve per lb. of Steel at various Temperatures assuming a Mean Specific Heat of 160 at all Temperatures
A. % Efficiency 1 Cu. Ft. Gas per lb. of Steel.
Heat Contents B.T.U. per lb.
0.30 % Carbon (Meuthen).
B.
C.
"Heat Content B.T.U./lb."
% Efficiency.
°Fahrenheit
°Centigrade

FIG. 1.—HEAT CONTENT AND EFFICIENCY.

perature, a long period is required to obtain the necessary depth of carbon penetration.

There is scope for development in the control of combustion and furnace atmosphere.

FURNACE ECONOMY.

Furnace economy cannot be obtained unless proper attention is given to the matter of insulation. The 4½ in. or so of firebrick sometimes met with is by no means adequate. The makers of this class of furnace must, of course, be aware of this fact, so one can only presume that price is often the factor which most influences the purchaser, and that insufficient attention is given to the efficiency and other merits of the furnace. Good results can be obtained in furnaces required for temperatures of about 900° C. if the usual firebrick lining is enclosed by 4½ in. of insulating brick (of the Nonpareil or Moler type). This may with advantage be further backed by magnesium slabs or asbestos board. When this practice is followed, care should be taken to see that the furnace arch is well supported, otherwise the lateral thrust may compress the magnesium slabs, with consequent fracture of the arch.

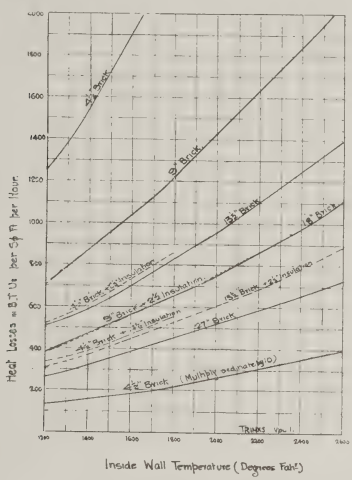

Heat Losses in B.Th.U. per Sq. ft. per Hour
9" Brick
4½" Brick + Insulation
4½" Brick + 2½" Insulation
4½" Brick + 4½" Insulation
4½" Brick (Multiply ordinate by 10)
TRINKS Vol. I
Inside Wall Temperature (Degrees Fahr.)
Heat Loss through Furnace Walls (for atmospheric pressure in furnace)

Fig. 2.—Effect of Insulation on Heat Losses through Furnace Walls.

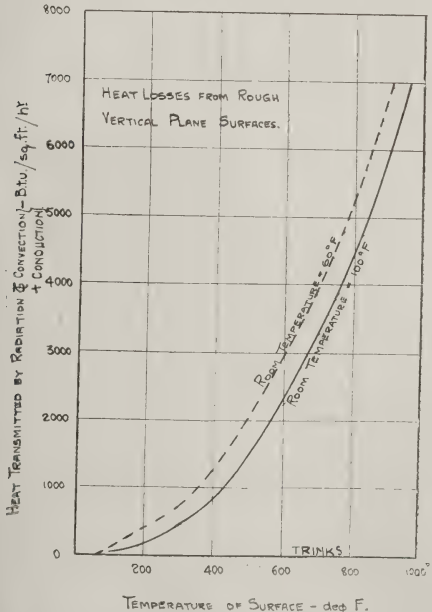

HEAT LOSSES FROM ROUGH VERTICAL PLANE SURFACES.
HEAT TRANSMITTED BY RADIATION & CONVECTION - B.t.u./sq. ft./hr. + CONDUCTION
Room Temperature = 60° F.
100° F.
Room Temperature
TRINKS
TEMPERATURE OF SURFACE - deg. F.

Fig. 3.—Heat Losses through Furnace Walls at Different Temperatures.

Fig. 2 clearly shows the value of proper furnace wall thickness and construction.

Fig. 3 shows the heat losses by radiation, conduction, and convection from a vertical surface—*e.g.*, the sides of a furnace. The losses through the furnace top due to convection are more than for the sides, and the losses through the bottom are less.

RECUPERATION AND REGENERATION.

Hot flue gases are responsible for serious loss of furnace efficiency. This loss can be reduced to a minimum by transfer of the heat contained by the outgoing flue gas to the incoming air required for combustion. This transfer not only returns sensible heat to the furnace which otherwise would be wasted, but also reduces the specific gravity of the air, which enables it to mix more thoroughly and quickly with the gas. The speed of mixing is important, as it has considerable influence on the speed of combustion, which, of course, affects flame temperature. High flame temperatures are important, as the rate of heat transfer from the hot gases to the work and the furnace is governed by the difference in temperature between the gas and the work.

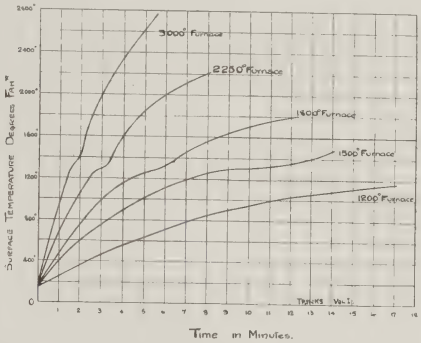


Fig. 4.—Time required to heat Bars, at Varying Furnace Temperatures.

Fig. 4 illustrates this point. It shows the relative time taken to heat up a 1-in. diameter bar at different furnace temperatures.

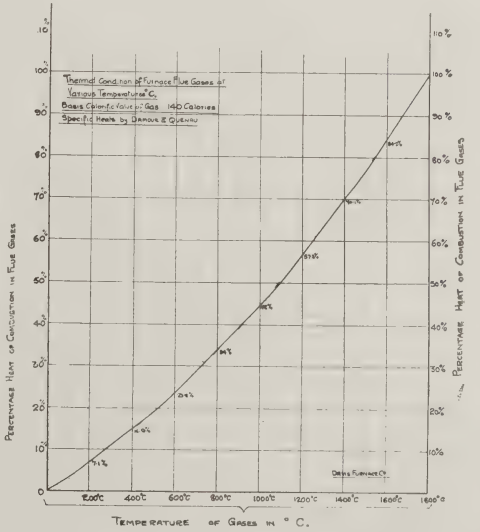

Thermal Conductivity of Furnace Flue Gases at Various Temperatures C.
Basis Calorific Value per Gas 140 Calories
Specific Heats by Damour & Guerout
Percentage Heat of Combustion in Flue Gases
Percentage Heat of Combustion in Flue Gases
Davis Furnace Co.
Temperature of Gases in ° C.

Fig. 5.—Heat Losses by Flue Gas at Various Temperatures.

Fig. 5 is drawn from information published by the Davis Furnace Company, and shows the percentage of heat of combustion contained in flue gases at various temperatures. If we take an air-blast gas furnace with gases leaving the flue at 1250° C., we see that 60 p.ct. of the heat generated is lost, whereas, if the flue gas temperature is by efficient recuperation reduced to 200° C., the loss is only 7 p.ct.

Fig. 6, compiled from the same source, shows the recuperative value of air when the total amount required for combustion is heated by the flue gases to various temperatures.

Figs. 5 and 6 indicate theoretical conditions; but there is no reason why they should not be approached in practice. The very low flue-gas temperatures cannot, however, be absolutely attained, partly owing to the loss of the latent heat of the moisture contents of the flue gas which finally leaves the furnace in an uncondensed state.

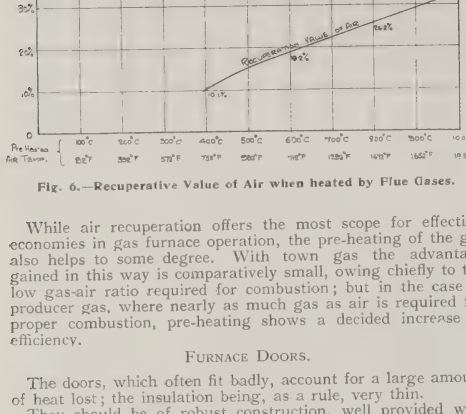


Fig. 6.—Recuperative Value of Air when heated by Flue Gases.

While air recuperation offers the most scope for effecting economies in gas furnace operation, the pre-heating of the gas also helps to some degree. With town gas the advantage gained in this way is comparatively small, owing chiefly to the low gas-air ratio required for combustion; but in the case of producer gas, where nearly as much gas as air is required for proper combustion, pre-heating shows a decided increase in efficiency.

Furnace Doors.

The doors, which often fit badly, account for a large amount of heat lost; the insulation being, as a rule, very thin.

They should be of robust construction, well provided with insulation, and large enough to cover fully the furnace opening and make a virtually gas-tight joint with the furnace front when shut and clamped-up. The weight and bulk of a substantial door are no detriment if a balanced quadrant and operating lever be provided, instead of the more usual chain and weight, which, even with a light door, is anything but "handy."

A New Annealing Furnace.

With the object of reducing the cost of pot replacements and also the cost of fuel used per unit of work produced, and at the same time of increasing the output, a new type of continuous bright annealing furnace has recently been put on the market. I have had an opportunity of testing and observing the performance of one of these furnaces (made by the Lucas Furnace Company) for the last fourteen months or so. It was designed for close annealing bright steel pressings for the motor and cycle trades, and was put in competition with two other gas-fired furnaces of high efficiency and repute. In both cases full advantage was taken of air recuperation and proper insulation. After one or two modifications to the furnace, the claims made have been fully justified. Clean bright work can be produced, thick heavy pots have been eliminated, the labour cost has not been increased, the output per furnace has been in most cases doubled or trebled, and the gas consumption per pound of metal treated has been reduced by 50 p.ct., and in some cases by 66 p.ct. Further experiments are being made, which, I am convinced, will have the effect of reducing the gas consumption still more. The time elapsing between the components leaving and returning to the press shop has been reduced by over 50 p.ct., which will enable a larger output to be obtained with less floating stock; the machine is easily managed by semi-skilled labour; and the quality of output is satisfactory. Rusty work can be put into the furnace and brought out practically clean without extra cost.

Running Costs of Furnaces.

I propose to give a few figures as to the comparative costs of running a few furnaces of different makes and types under actual manufacturing conditions; the object of this being to impress on the engineer some of the advantages he may expect to gain by giving the same close attention to the selection and running of his furnaces as he does to his machine tools. In the following tests all the furnaces are by makers of wide repute, and were supplied for the class of work upon which the tests were conducted. The majority of the furnaces are run continuously day and night during the working week, and the tests were all of several hours' duration. It is not claimed that the results are particularly good. The tests were carried out in order to compare the various makes and types of furnaces under normal working conditions. The furnaces grouped together for comparison are similar in size, and the work done is the same. Other conditions were as nearly as possible the same.

Table I. gives the comparative gas consumption of various furnaces used for re-heating work after carburizing.

Table I.—*Reheating after Carburizing.*

Furnace.	C.Ft. of Gas per Lb. of Metal Heated.
1. American forced-draught, under-fired	5·92
2. British fan draught, recuperative	2·56
3. British natural draught, regenerative	2·44

Table II. gives the gas consumption of various furnaces on carburizing.

Table II.

Furnace.	C.Ft. of Gas per Lb. of Net Useful Load Heated.
1. Reverberatory, natural draught	56
2. Forced draught, under-fired with flat roof	88·5
3. Forced draught, under-fired with arched roof. Roof slightly lower than No. 2	53·5
3a. As No. 3, but with better insulation	42
3b. As No. 3a, with air heated to 175° C. by flue gases	35·7*
4. Regenerative	29·5†

Gas per lb. gross load, 15 p.ct. of above.

* Saving of 33⅓ p.ct. over No. 3.

† Slightly larger furnace than the above, holding larger load.

Note.—Weight of carbonizing boxes and material not included as useful load.

Table III. gives the costs of running the bright annealing furnace and the ordinary type of close annealing furnace.

Table III.—*Comparative Running Costs of the Bright Annealing Furnace and Modern Recuperative or Regenerative Furnaces under Working Conditions.*

Conditions: Full load over extended periods on various classes of steel pressings requiring to be close-annealed without scale.

Work.	Standard Types of Furnace (Regenerative or Recuperative).		Bright Annealing Continuous Furnace.	
	No. per Hour Output.	Gas Consumed per Lb. of Metal.	Output per Hour.	Gas Consumed per Lb. of Metal.
		C.Ft.		C.Ft.
A. Light bulky components	210	14·9	480	4·26
B. Lightsmaller components	108	10·1	200	3·49
C. Medium small components	72	11·2	120	4·26
D. Heavy larger components	25	8·13	36	3·6
	Average =	11·1 c.ft. per lb. of metal annealed	Average =	3·73 c.ft. per lb. of metal annealed
Hourly running cost, including pot wastage and miscellaneous stores	23d. for 67·6 lbs. of metal 0·34d. per lb.		16·36d. for 129 lbs. of metal 0·126d. per lb.	

[Since the above tests, this has been reduced, but it is early yet to say how far the reductions will be permanent.]

The labour costs were the same in both cases; but if two bright annealing furnaces had been available, the labour cost on same would have been reduced by 50 p.ct. Also, there is no doubt that the thermal efficiency of the bright annealing furnace can be improved by better insulation and better means of ensuring complete combustion of the gas. The gas used per lb. of metal annealed is for the net amount of useful work produced; the weight of the pots is not included as useful load.

"Vertical Retorts."—At the next meeting of the Junior Institution of Engineers, to be held at No. 39, Victoria Street, S.W., on Friday (April 17), a paper on "Vertical Retorts," illustrated by lantern slides and models, is to be read by Mr. Walter T. Dunn, M.I.Mech.E.

Iron and Steel Institute.—The annual meeting of the Institute is to be held at the Institution of Civil Engineers, Great George Street, S.W., on Thursday and Friday, May 7 and 8. Sir Frederick Mills, Bart., will deliver his Presidential Address, and a number of papers will be presented. Members will dine together at the Hotel Cecil on the Thursday evening.

Seventy-Five per Cent. Waste.—In the speech of Mr. H. James Yates at the annual meeting of Radiation Ltd., as reported in the "Journal" for April 1, there was a printer's error in the paragraph headed "The Smoke Problem." Mr. Yates was made to say: "When coal is burned in its crude form in an ordinary coal grate, the direct waste of fuel is estimated at 5 p.ct." It will have been obvious to most of our readers that the "5" should have been "75."

THE GAS INDUSTRY IN NEW ZEALAND.

[A few extracts from the Presidential Address delivered by Mr. James Lowe, M.Inst.C.E., Manager and Engineer of the Auckland Gas Company, Ltd., at the First Annual Meeting of the Gas Institute of New Zealand.]

The density of population in our cities and towns is much less than in the Homeland. This arises from the practice of building—except in principal streets—houses of the detached type on sections usually not less in size than a quarter of an acre. This practice, while it has many advantages, is the cause of a greater expenditure on mains than might otherwise be necessary. The incidence of the cooking load also is different from that in Britain. The chief meal of the day for all classes of people is taken in the evening; and in winter the peaks of the lighting, heating, and cooking loads overlap between five and six o'clock. In fact, the incidence and nature of the cooking load as compared with lighting tends to increase the capital expenditure, per 1000 c.ft. of gas sold, on mains. However, by means of high-pressure distribution superimposed on a low-pressure reticulation system, great economies can be made in the cost of mains in a growing district.

Gas Engineers Their Own Contractors.

Gas engineers and managers in the Dominions have to rely on themselves to a much greater extent than their confrères at home have to do. There are practically no firms within easy reach who specialize in the manufacture of gas plant available. In consequence, the engineer has not only to prepare plans, specifications, and detailed estimates of much of his plant, but in addition has frequently to do the fabrication and almost invariably the erection with his own staff. For this reason the larger gas-works in the Dominions are equipped with workshops and appliances on a scale exceeding that to be found in similar-sized works in Britain, where there is a much greater dependence on contractors for repairs, as well as for new work. One result of the war has been to encourage the manufacture of plant in the Dominion.

It takes at least five months—often much longer—to receive goods from Britain after ordering by mail; and it is necessary for New Zealand gas engineers and managers to look well ahead with their requirements. They must devote some little attention to the matter of indenting, for it is a serious matter to run short of essential things, the absence of which would seriously interfere with the manufacture or supply of gas.

Effects of Freight Insurance Tariff.

The facts that we are from twelve to thirteen thousand miles away from the manufacturers, and that New Zealand possesses a Customs Tariff, add considerably to the cost of our imports. The costs of freight, insurance duty, wharfage, &c., have to be added to the home cost, so that on the average we have to pay from 40 to 50 p.ct. more than our confrères in Britain for all goods we import. Rates of wages also are higher in the Dominion than they are in Britain. These conditions, together with the greater cost of coal, explain why gas prices must be higher in the Dominion than they are in Britain.

Unfair Competition.

The gas industry has to face competition from power boards supplied with electricity from State hydro-electric works. The Government are spending huge sums on these schemes, and are subsidizing them in various ways. The power boards are required to pay neither income-tax nor local rates, and deficits are made good from the general revenue of the State. In addition, they receive indirect subsidies through the Customs, since "all machinery and appliances peculiar to the generation of electricity," including electric motors, cables, insulators, &c., are duty-free, while gas and steam engines are charged 10 p.ct duty, and cast-iron pipes above 9 in. diameter and steel pipes above 6 in. diameter 20 p.ct. duty. It is only fair to say, however, that machinery for any manufacturing purposes is now admitted free of duty provided it can be shown to the satisfaction of the Minister of Customs that the same could not have been economically manufactured in New Zealand.

Labour Legislation.

Perhaps the most uncongenial duties which fall to the lot of gas-works engineers and managers in New Zealand are those in connection with industrial disputes. The Industrial Conciliation and Arbitration Act of 1908 and the Labour Disputes Investigation Act of 1913 are probably the most advanced labour legislation in the world. Under these Acts the maximum term for which awards and agreements can be made is three years, but in practice the award or agreement is almost invariably fixed for a term of two years. Disputes are therefore automatically created in every trade or class of labour every two years. The workers' Unions are nearly always the applicant parties, and they draw up and serve on employers schedules of demands which are not usually characterized by moderation. Shorter hours, higher wages, increased rates for overtime, extra pay for certain classes of work, &c., are usually demanded.

Employers have then to draw up counter proposals, and to spend much time in Conciliation Council or at the meetings of a Labour Disputes Committee. These meetings sometimes continue for a fortnight; and when no settlement is reached, the dispute goes to the Arbitration Court if under the Industrial Conciliation and Arbitration Act, or to a vote of the workers as to whether they will strike or not, if under the Labour Disputes Investigation Act.

Gas engineers and managers in New Zealand have to devote to labour matters much more time than have their confrères in Britain.

Coal.

The only bituminous coals in the North Island are found in the neighbourhood of Whangarei, about one hundred miles north of Auckland, but these coals are not used for gas manufacture, on account of their high content of sulphur, which is about 4 to 5 p.ct. The chief coalfield in the North Island lies about 100 miles south of Auckland in the valley of the Waikato, and is an excellent lignite. Unfortunately its yield per ton is only about 10,000 c.ft. of gas having a calorific value of 400 B.Th.U., or 40 therms. The coke is exceedingly friable, light, and difficult to quench. Needless to say, this lignite coal is not much used for gas manufacture. In Auckland we—in common with the other New Zealand gas-works—draw our principal coal supplies from the Maitland coalfield of New South Wales and from the West Coast mines of the South Island of New Zealand.

A comparison of prices of coal delivered into the Auckland Gas-Works in 1913 and 1924, together with the prices charged for gas, is of interest:

Year.	Coal.		Gas.		Income-Tax.	
	Cost per Ton.	P.Ct. Increase.	Price per 1000 C.Ft.	P.Ct. Increase	Rate per £1.	Pence per 1000 C.Ft.
	s. d.		s. d.		s. d.	
1913 ..	22 4	..	4 3	..	1 2	0·68
1924 ..	42 9	93	7 6	76	5 10	6·02

The Auckland Gas Company, Ltd

The memorandum of the Association of the Company is dated July 23, 1862. On April 15, 1865, gas was supplied for the first time. The output in 1866 was 6,755,000 c.ft. and the price 20s. per 1000 c.ft. In 1924 the output was over 1302 million c.ft. Altogether there are 403 miles of low-pressure reticulation and 48¾ miles of high-pressure mains ranging in size from 18 in. to 3 in. For low pressure, ordinary cast-iron mains with cast lead joints are used, for high pressure, wrapped and coated steel tubes with long rigid joints are preferred. The manufacture of firebricks and retorts as a branch of the Company's business was begun in 1884.

Warner Low-Temperature Retort.

The Economic Carbonization Company are completing at Petersburg (Va.) an installation of four retorts of commercial size designed and patented by Mr. A. W. Warner, which, it is stated by Dr. Horace C. Porter, in a paper submitted to the Franklin Institute, on "Low-Temperature Coal Carbonization and Its Prospective Industrial Development," will utilize the principle of withdrawal of the volatile matter chiefly in a direction away from the source of heat. The retorts are vertical, made of metal (of special heat-resisting alloy in the top section), and heated in a setting of gas-burning flues. These flues provide higher heat at the top of the retorts, and lower at the bottom. Within each retort is a worm conveyor propelling the coal upward; and through the hollow shaft of this worm the gases are drawn-off. The feed of coal is so designed that it meets the off-coming gases and vapours, cooling them and seturning the condensed heavy oils with the coal into the retort. It is claimed by the inventor that the condensates, since they bear no free carbon or pitchy residues, will not clog the outlets. The minimum capacity of this retort is set down at 10 tons per day. The process is designed to produce a free-burning coke of not over 2 p.ct. volatile matter, a high yield of oils, a fair yield of ammonia, and about 8000 c.ft. of 750 to 800 B.Th.U. gas. The Petersburg plant is expected to operate commercially in conjunction with the local gas-works, and turn its gas into the city mains. It is a process wherein low-temperature carbonization is combined in an ingenious manner with certain features of high-temperature carbonization; and, he adds, its practical development is to be awaited with special interest.

Yorkshire Junior Gas Association.—Arrangements have been made for members to visit, on Saturday afternoon, April 18, the works of Messrs. J. Blakeborough & Sons, Ltd., in Birds Royd Road, Brighouse. Visitors will assemble at the works at 3 o'clock.

London and Southern District Junior Gas Association.—A meeting will be held at the Westminster Technical Institute, Vincent Square, S.W. 1, on Friday next, April 17, at seven o'clock, when Mr. Dean Chandler, of the South Metropolitan Gas Company, will read a paper entitled "Fuel in Industry."

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Spirally-Guided Flying Lifts.

Sir,—With reference to the two letters appearing in your last issues as to the patent of our Mr. William Blakeley, we would like to make it clear that, at the time of taking out this patent, we were not aware that any similar idea had been previously adopted.

In view of the evidence now put forward, we realize that, though the patent has been granted to us, we cannot object to those firms who, prior to the patent, had added spiral flying lifts of their own design to column-guided gasholders.

The system of spirally-guided flying lifts as designed by us and on our principle is, we submit, substantially stronger and safer than the ordinary method of flying-lift construction, and gives the same stability to the flying-lift as in the usual lifts of the ordinary spiral-guided gasholder.

Last year we constructed a new three-lift gasholder on this principle on the South Coast, which has proved very satisfactory, having stood without "flinching" the exceptional gales experienced at the end of last year, though fully inflated the whole time. Those who were residing on either the Kent or Sussex coast at that time will know what a severe test to a gasholder that occasion was.

Our firm have another gasholder in hand for a Southern works on the same principle. We contend that no independent engineer who thoughtfully studies our design can deny it is a far safer proposition than the ordinary type of flying lift.

For Firth Blakeley, Sons & Co., Ltd.,
H. Blakeley,
Secretary.

Church Fenton, via Leeds,
April 10, 1925.

REGISTER OF PATENTS.

Carbonization.—No. 228,763.

Rude, J., of Hyde Park, W. 2.

No. 12,681; May 23, 1924.

This invention is a development of that contained in specification No. 204,718. The latter relates to carbonization of solid fuel consecutively in an internally-heated low-temperature retort and an externally-heated high-temperature retort; the process consisting mainly in the utilization for carbonization purposes of the heat of the flue gases, which have served to heat the high-temperature retort externally, by leading them to a heat interchanger, where the gaseous fluid which, by its sensible heat, performs the low-temperature operation in the internally-heated retort, is heated.

In the original application, the gaseous fluid which performs the low-temperature operation, and the gases emanating from the externally-heated retort, meet and mix outside the retorts. According to the present invention, the two retorts are now arranged in such a way that their interiors communicate freely, and virtually constitute one apparatus comprising an upper and a lower retort, so that the fuel within them forms an unbroken column, the lower part of which is subject to external heating, and the upper part to internal. This communication of the retorts makes it necessary that the gases produced in the externally-heated part shall not be removed from the latter for the purpose of mixing them with the gaseous fluid destined for the low-temperature operation in the internally-heated part, but shall on the contrary be left to ascend freely through both retorts, so that the encounter of the gases from the lower retort and the gaseous heating fluid takes place somewhere in the interior of either of the two retorts.

The reason for the suggested modification is to make it possible to carbonize a fuel in lump form—for instance, coal briquettes, which, to avoid breakage, can pass consecutively through both retorts without meeting any obstructions on the way, which are inevitable if the gases from the lower retort are prevented from entering directly into the upper retort.

Another feature of the new invention relates to leading the gaseous fluid, which performs the carbonization in the upper retort by its sensible heat, through the hot coke in the lower part of the externally-heated retort, before the fluid enters the heat interchanger. The reason for this innovation is twofold. First, the contact of the gaseous fluid with the hot coke causes a conversion of the hydrocarbon vapours into permanent gases, and thus prevents a decomposition of the hydrocarbons from taking place later on in the heat interchanger, where cracking may interfere with its regular working. Secondly, the sensible heat of the coke is to a large extent transferred to the gaseous heating fluid and subsequently utilized for carbonization, the coke being at the same time cooled.

Dry Meters.—No. 228,795.

Cooke, A. G., and Phillips, B. C., both of Joymanco (Brighton) Limited, of Hove.

No. 19,304; Aug. 14, 1924.

(Patent of Addition to No. 207,072, Jan. 5, 1923.)

The parent patent was noticed in the "Journal" for Dec. 26, 1923. The measuring chamber is now modified by the rim having an annular recess stamped or swaged to the outer edge, being of a shape approximating to the form of a half-ellipse. A split ring is inserted over the removable diaphragm and mounted in the annular recess compressing the flexible material of the removable diaphragm at two separate positions, each being near the respective end of the swage in the rim and allowing the dressing oil in the flexible material to be retained between the compressed portions. An annular V or U shaped groove is formed in each of the discs of the diaphragm.

Ascension Pipes.—No. 229,863.

Mackenzie, M., of Ecclesfield, Sylvester, J., of Barnsley and Outwin, E., of Worsborough.

No. 5272; Feb. 29, 1924.

According to this invention, an ascension pipe comprises sections each provided with a plurality of openings at intervals in its length, adapted to be temporarily sealed. Conveniently these openings are provided with removable plugs, flap doors, or equivalent means whereby they may be temporarily closed; but if desired, they may be stopped with fireclay, &c. Preferably the openings are formed in bosses cast on the pipes, the axes of the openings being at an angle with the axis of the pipe.

The openings may be at uniform intervals along the pipe or closer together adjacent to the foot than elsewhere, where also they may be larger than the openings remote therefrom. Usually it will be found preferable to arrange adjacent openings in staggered relationship one with the other.

Normally, air will be admitted to the pipes through the openings for the purpose of burning out the deposit when the oven is taken off from the gas main and is awaiting discharge, the order of unsealing of the openings being preferably from the top toward the foot. The admission of air through several openings facilitates burning out the carbon; and the removal of the deposit may be further facilitated or accelerated by rodding.

Producers.—No. 229,891.

Regenerative Coal Gasification System, Ltd., Travers, M. W., both of Queen Victoria Street, E.C. 4, and Clark, W., of Lymm.

No. 8653; April 5, 1924.

This invention relates to gas-making plant as described in specifications Nos. 198,777 and 210,356 [see "Journal," Vol. 163, p. 312, and Vol. 165, p. 569, respectively].

According to the present invention, the patentees divide the carbonization chamber of the plant into compartments by means of vertical or substantially vertical partitions extending for part or for the whole of the distance from the top of the carbonization chamber to the nostril leading to the regenerator, so that the mass of coal is sub-divided. They find, especially in the case of large plants, that by such subdivision a better yield is obtained, as the coal undergoes a more uniform and more rapid treatment than is possible when there is a large undivided mass.

Testing Pipe Joints.—No. 229,991.

Ross, D., and Weiser, R. F., both of Newport, and The British Mannesmann Tube Co., Ltd., of Queen Victoria Street, E.C. 4.

No. 1316; Dec. 21, 1923.

This invention relates to pipe-testing apparatus of the type mentioned on p. 127 of last week's "Journal" as having been patented by the same claimants.

According to the present invention, the casing, which consists of a segmental split ring and a segmental closing member disposed in a gap arranged between the ends of the ring, is expanded by the instrumentality of a bolt which is connected at one end to a lug on the closing member and at the other end is adjustably housed in a socket formed in a lug on the ring, in conjunction with toggle mechanism comprising a collar slidably mounted on the bolt, toggle links pivotally connected with the collar and bearing against projections provided on the terminal portions of the ring, and means for moving the collar along the bolt.

Furnaces.—No. 230,125.

Gibbons Bros., Ltd., and Marle, M. V., both of Dudley, and Walter, C. M., of Birmingham.

No. 24,804; Oct. 5, 1923.

This invention relates to gas-fired furnaces in which chambers for preheating air and gas are located within the walls of an enclosed furnace and below the working chamber or chambers thereof; the preheating chambers being heated by the exhaust gases of the furnace. The object of the invention is to provide a more efficient and more easily controlled and regulated furnace.

According to this invention, the furnace comprises separate air and gas regenerative chambers adapted to be heated by contiguous chambers through which the exhaust gases pass, separate conduits leading to the burners, valves for controlling the air and gas between the chambers and the burners, gas ports in the burners, and separate air ports disposed laterally of the gas ports. The arrangement is such that the air issuing from the ports converges towards and mixes with the gas stream, prior to which the air has been maintained entirely separate from the gas.

In one construction a plurality of separate burners located longitudinally below the working chamber have each a central section delivering gas and two separate outer sections delivering air. The air preheating passages are arranged in two groups between three groups of exhaust passages, and one of the air sections of each burner is connected by a separate passage with one of the preheating groups, while the other air section of each burner is similarly connected with the other group of preheating passages.

In an alternative construction the air passes from a plurality of groups of air preheating passages into a common chamber, and conduits convey the air from the common chamber to a plurality of points near each side of the working chamber.

These forms of the furnace are fully described in the specification, in connection with 13 detail drawings.

Gas Taps.—No. 230,143.

Helps, G., of Nuneaton.

No. 30,048; Nov. 29, 1923.

The patentee says that "the main object of this invention, as indeed has before been proposed, is to utilize the pressure available

while a burner is called on to pass small quantities of gas, so that the flame may be produced always from a completely combustible mixture. The burner can be used in districts having different qualities and pressures of gas without alteration except bringing a different number of nipples into action."

The plug on the barrel of the gas cock claimed contains a plurality of gas ways acting as nipples or provided with nipples injecting gas into a single burner; the arrangement being such that as the cock is opened or closed, one or more or all of the gas ways is or are brought into operation.

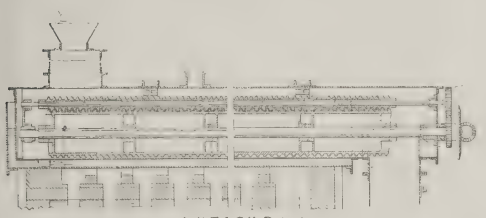
Heat Treatment for Distilling, Drying, or Carbonizing.

No. 230,223.

"T.I.C." Research Co., Ltd., Duckham, Sir A. M'D., Rider, D., and Watts, J. S., all of Grosvenor Gardens, S.W. 1.

No. 1413; Jan. 17, 1924.

By this invention, which relates the heat treatment of materials for distilling, drying, or carbonizing them in a trough, retort, or the like heated by molten metal, it is claimed that the material is distributed in a comparatively thin layer over the heating surface by a device which both spreads the material as a layer and turns it over, and that in this manner practically every particle comes into contact with the heating surface during the process.



A "T.I.C." Retort.

It is pointed out that the invention is particularly applicable for the known method of subjecting coal which is to be coked to a preliminary low-temperature carbonization; also for the destructive distillation of shale, and for the distillation of tar oil until a coke residue is obtained.

We reproduce part of a longitudinal sectional drawing which accompanies the specification, omitting the oil-fired furnace and extractor shown in the original. A trough-shaped retort is set in a correspondingly shaped bath containing lead which is kept at the required temperature above its melting point by the oil-fired furnace. A shaft is mounted at one end in a bearing within the retort and at the other end in a bearing carried by the end of the retort. On it is fixed a left-hand screw-threaded cylinder (the conveyor) which is in mesh with a right hand screw (the spreader and scraper) of similar pitch and carried by a shaft mounted above the first.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

Progress of Bills.

Bills, as amended, considered, and to be read the third time: Barrow-in-Furness Corporation, Gas Light and Coke Company, Stockton-on-Tees Corporation.

Bill read the third time, and passed: Bolton Corporation.

The Standing Orders having been complied with, the Horley District Gas Company (Electricity Supply) Bill, and the Rochdale Corporation Bill are to be read a second time.

Gas Regulation Act.

In the House of Lords, on the motion of the Earl of Onslow (on behalf of Viscount Peel), the draft Special Order relating to the Gloucester Gas Light Company was agreed to. A similar motion was approved in the House of Commons on the proposition of Sir Burton Chadwick.

Copies were presented of drafts of Special Orders proposed to be made by the Board of Trade under the Act, on the application of the Brighouse Corporation, Pinner Gas Company, and the Yeadon and Guiseley Gas Light and Coke Company.

BARROW-IN-FURNESS CORPORATION BILL.

This Bill (see "Journal" for Jan. 21, p. 142) has been under consideration by the Local Legislation Committee of the House of Commons. The clause giving power to sell, let on hire, and maintain gas apparatus and fittings has been withdrawn by the promoters.

WESTMINSTER CITY COUNCIL (GENERAL POWERS) BILL.

This Bill was considered by the Unopposed Committee of the House of Commons (presided over by Mr. James F. Hope, Chairman of Ways and Means) last Wednesday, and ordered to be reported for third reading.

Originally, the Bill contained a clause enabling the City Council to construct subways; but petitions were deposited by the Gas Light and Coke Company, the Metropolitan Water Board, and Electricity Companies, on the ground of interference with their mains. Consequently the promoters withdrew the clause

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

Annual Report of the Directors.

The following is the report of the Directors for the year ended Dec. 31, which will be submitted to the proprietors at the 177th Ordinary General Meeting on May 13.

Of the agreed compromise in respect of the Association's German claims, a further instalment of 7s. 6d. in the pound on the outstanding balance has been received, and is incorporated in the accounts for 1924. The proportion of this instalment which represents realized accretion to capital, together with the undistributed balance of that account, amounts to £388,903 8s. 1d. The Directors recommend that this sum of £388,903 8s. 1d., being an accretion to capital which has been realized and turned into money, be dealt with as profit and applied in payment of a special dividend for the year 1924 at the rate of 19¼ p.ct. per annum on the nominal amount of the issued capital stock of the Association, payable on May 26.

The profit for the year (inclusive of the revenue proportion of the German claim instalment) is £230,628 4s. 1d., which, together with the sum of £45,951 0s. brought forward from the previous year's account, makes a total of £270,579 10s. 1d. available for appropriation, out of which an interim dividend of 5 p.ct. (actual), less tax, amounting to £76,570 12s. 9d., was paid in November last. The Directors now recommend that, in addition to the 19¼ p.ct. special dividend, there be also paid on May 26:

(*a*) A final ordinary dividend at the rate of 5 p.ct. (actual), less income-tax at 4s. 6d. in the pound, making the total ordinary dividend for the year 10 p.ct.

(*b*) A special bonus dividend, in celebration of the Association's centenary, at the rate of 5 p.ct. (actual), less income-tax at 4s. 6d. in the pound.

The sum of £46,867 11s. 10d. will accordingly remain to be carried forward to the next account.

The total output of gas in the towns supplied by the Association in 1924 was 5474 million c.ft., showing an increase at the rate of 5·3 p.ct. on the preceding year. The number of consumers on Dec. 31 last was 257,412, and shows an increase at the rate of 0¼ p.ct. in the year. The quantity of coal carbonized during the year under review was 316,200 metric tons, at an average gross cost per ton delivered on to the works of 27s. 2d., or 1s. 3d. per ton more than in the preceding year. The Droogenbosch electricity works at Brussels sold, during 1924, 21,574,759 KW.H., as compared with 16,031,129 KW.H. in 1923, an increase of 5,543,630 KW.H., or 34·58 p.ct. On Dec. 31, 1924, 1425 miles of gas mains and 547 miles of electric cables were in use, as compared with 1378 and 264 miles of mains and cables, respectively, on Dec. 31, 1923.

At Antwerp contracts giving the Association a gas monopoly until 1959 were concluded with the Communes of Halle (1060 inhabitants) and Merxplas (3067 inhabitants). At Brussels prolongations of contract for the supply of gas and electricity were secured at Linkebeek (3322 inhabitants) until 1945, at Uccle (35,755 inhabitants) until 1953, and at Woluwe-St.-Pierre (9917 inhabitants) until 1954. New contracts for the supply of gas and electricity were also concluded with the Commune of Schepdael (2234 inhabitants) until 1963, and with the Communes of Gaesbeek (376 inhabitants), Lennick-St.-Martin (1708 inhabitants), Lennick-St.-Quentin (2824 inhabitants), Lombeek-Ste.-Marie (709 inhabitants), Strijthem (847 inhabitants), and Wambeek (1782 inhabitants) until 1964.

At Antwerp the erection of three new naphthalene washers on the Berchem Works was completed. On the Hoboken Works the foundations of a new water gas plant were finished, and good progress was made with the erection of four new purifiers. A waste-heat boiler for the horizontal furnaces was also put into action with satisfactory results. Owing to the growth of business, the accommodation at the Cappellen District Office, near Antwerp, was found to be inadequate, and an additional plot of land was acquired. Moreover, in order to facilitate railway connection with the Association's site at Schooten, north-east of Antwerp, a strip of land was purchased there.

At Brussels, the renewal of six settings of vertical retorts on the Forest Works was almost completed, and eight settings of horizontals on the Koekelberg Works were reconstructed. Good progress was also made with the enlargement of the Chaussée d'Ixelles offices. At the Droogenbosch central station the extension of the buildings to house the new boilers and generators was completed, and two new turbo-alternators, one of 3750 KW. and the other of 10,000 KW., were put into action. The installation of a second 10,000 KW. turbo-alternator was also practically finished.

The gas-works at Bruex (a town of 27,000 inhabitants in Czecho-Slovakia), which were purchased by the Association in 1898, were ceded to the Municipality on Oct. 1 last, in accordance with the terms of the contract.

The Board regret to announce the death, on June 26, 1924, of Mr. H. G. Newton, who had been a Director since March, 1906. To fill the vacancy thus caused, Mr. George Jessel, M.C., has been elected to a seat on the Board. The Directors who go out of office by rotation are Colonel H. LeRoy-Lewis, C.B., C.M.G., D.S.O., Mr. Robert William Wilson, and the Rt. Hon. Sir Guy Douglas Arthur Fleetwood Wilson, G.C.I.E., K.C.B., K.C.M.G. They are eligible for re-election, and offer themselves accordingly. The Auditor who retires is Mr. C. F. Dendy Marshall, who is eligible for re-election, and offers himself accordingly.

(Signed) C. J. Jessel,
Chairman.

HONG KONG AND CHINA GAS COMPANY, LTD.

Annual General Meeting.

The Annual General Meeting of the Company was held at the Offices, No. 148, Gresham House, Old Broad Street, E.C., on Monday, March 30—Mr. Robert H. Glen, F.C.A. (the Chairman), presiding.

The Secretary (Mr. A. C. Pullen) read the notice convening the meeting and the Auditors' report.

The Chairman: Gentlemen, a copy of the report and statement of accounts having been sent to all the shareholders, I will ask you to take them as read.

Before I pass on to our ordinary business, you will perhaps permit me to refer to the fact that to-morrow is the first anniversary of Mr. Phillips' death. We miss his presence, but continue to benefit by the wise direction he gave to our affairs in his lifetime. You will have learned from the report of Mr. Wardrop's resignation from the Board. This was a cause of much regret to the other Directors, who tried hard to persuade Mr. Wardrop from taking such a step. Mr. Wardrop felt, however, that the time had come for him to give way to a younger man, and that his health would not allow of continued strain. The Board invited Major Heriot R. Glen, M.C., to fill the vacancy; and I will only say of him that he brings to our counsels keen business insight, as well as his lifelong family connection with the Company.

I referred last year to the fact that considerable additions had been, and were being, made to public lighting by gas in Hong Kong, and that our Engineer was trying hard to get back some of our lost lighting trade. I am sure it will be of interest if I mention the following figures for lighting appliances sold, supplied on hire purchase, or sent out on loan during the past year, exclusive of material for public lighting: "Surbiton," "Esher," "Pyrol," and other burners and lamps sold outright or on hire purchase, 911; supplied under the loan system, 1555. We also sold outright or on hire purchase 367 cookers, grillers, geysers, rings, &c., and supplied on loan 1040. It is a fact that the Company sold more gas stoves in six months of 1924 than in the previous six years. The Company have showrooms at Hong Kong Works, Kowloon Works, and at Messrs. Lane Crawford's, also a shop in the Wanchai district. We are negotiating with one of the largest Chinese firms in the Colony for them to exhibit our wares and help to push for gas business among the Chinese, who are large potential customers for the Gas Company.

The sales of gas increased at Hong Kong by 8·16 p.ct. and at Kowloon by 20·38 p.ct.; and I would like to emphasize to you that our private lighting trade went up by 10·16 p.ct. and public lighting by 11·29 p.ct. For years past we have endeavoured, from this side, to do all that was possible to retain and extend our gas lighting in Hong Kong; but you, as well as I, know that many people were obsessed with the idea that gas for lighting was either dead or dying. If this view was, and is, held, even by people in this country, you will, I think, agree with me that our present Manager is doing well in this branch of our trade at such a place as Hong Kong. Although Kowloon continues to develop, we are a little disappointed that our trade there has not made greater strides. At the present time a carburetted water gas plant is on order, and should be in operation before the end of this year to cope with the growing business. We have spent a good deal of money at Kowloon during the past five years—from 1920 to this date, about £45,000—but the Board feel sure this expenditure will bring good results.

The Directors were pleased to mention in their report that the cost of coal will show a large diminution for 1925. For some years we have considered the question of sending English coal to Hong Kong, and at the end of 1921 we had a cargo actually on order; but, after drastic reductions in the price of Yubari had been forced from this side, the cargo of English coal was cancelled. However, the advisability of trying good-class English coal has since been constantly before the Board, and during 1924 we made an experiment with 1500 tons of Yorkshire coal. The results obtained were, on the whole favourable, and a full cargo was sent out early this year. We have, in addition, contracted for Yubari coal to be supplied during 1925 at a very favourable rate. Indeed, I may say that four years ago it was costing us 100 p.ct. more than the price of to-day. I assure you, Gentlemen, that very strenuous endeavours have been made in this question of coal—one which is so vital to our Company.

Reference to our accounts will show that we have made additions to capital amounting to £8521, about one-half of which is for mains and services. We carbonized 1314 tons more coal in 1924 than in the previous year, and the extra cost for carburetted water gas is explained by the total output of it being one-third higher. Maintenance of retorts shows a considerable increase over 1923, accounted for by work done at both Hong Kong and Kowloon. The item in the balance-sheet for material used on vertical settings—viz., £3410—we propose to charge to revenue during the next three years. Other revenue debits show increases in consequence of larger trade, &c. Gas rentals advanced from $428,368 to $483,565—an increase of $55,197; and the figures for residual products total $68,922, as compared with $57,615. The estimated value of coke used on the carburetted water gas plant is credited here, our sales of coke really being very small. I mentioned last year that the Board were continually considering matters relating to our coke sales. At present our coke is disposed of entirely through the hands of a local contractor; but this has proved an unsatisfactory method, so the Company are at present engaged in trying to get the arrangement modified and, in due course, abolished. We hope, at no distant date, to be able to improve on the results shown. The amount of £1050 charged in the net revenue represents the vote made by you to Mr. Phillips' Executors for engineering work carried out by that gentleman over a course of twenty years, and the expenses connected therewith. I do not think further comment is needed on our accounts. The balance of net revenue amounts to £53,947, and a dividend for the year of 10 p.ct., free of income-tax, is recommended, less the interim dividend of 5 p.ct. paid in October, 1924.

The question of the purchase of our undertaking remains in *status quo*. Since the offer was received, our business has grown very much indeed; and I think our accounts for last year fully justify the line which the Board have taken in this matter, after prolonged and careful consideration. We hope for, and expect, far better results in 1925. If another offer for purchase is received, which is more in line with the value of our business and our properties, the Directors will place it before the shareholders.

Our Manager (Mr. Blackburn), in circumstances of considerable difficulty, has fully merited the confidence placed in him by the Board, and he is ably seconded by the other members of the staff. As from Jan. 1, the Board have inaugurated a bonus on profits scheme, by which all the local staff and workpeople will benefit, from the Manager to the lowest workman. A provident scheme has also been instituted, and to this all the European members of our staff have signified their intention to contribute a portion of their pay. Before I conclude, I may mention that my colleagues on the Board have requested me to visit Hong Kong again, in order to deal with some important outstanding matters. I leave for the East immediately. With these remarks, I have pleasure in moving that the report and accounts be received and adopted.

Mr. Strachan C. Clarke seconded the resolution, which was carried unanimously.

The Chairman moved the following resolution:

> "That a dividend at the rate of 10 p.ct. per annum, free of income-tax, be declared for the year ended 31st December, 1924, less interim dividend paid 1st October, 1924; the warrants to be made payable on the 9th April."

This was seconded by Major Heriot R. Glen, and unanimously carried.

The Chairman then proposed the re-election of Mr. Strachan C. Clarke as a Director of the Company, which was seconded by Mr. Leonard Askew, and carried unanimously.

In returning thanks, Mr. Clarke referred to the many problems with which in recent years it had been necessary to deal, and stated that he believed the Company had a prosperous time now before them.

Mr. John G. Wardrop moved the re-election of Messrs. Cash, Stone, & Co. as Auditors for the current year.

This was seconded by Mr. John M'Cubbin, and carried unanimously.

The Chairman proposed a vote of thanks to the staff in Hong Kong and London, which was seconded by Mr. John M'Cubbin, and, after being warmly supported by Mr. John G. Wardrop, was unanimously carried.

The Secretary responded; and the proceedings terminated.

GAS REGULATION ACT APPLICATIONS.

The following notice has appeared in the "London Gazette" regarding an application to the Board of Trade under the Gas Regulation Act.

SPECIAL ORDER.

Croydon Gas Company.

Application is to be made by the Company for an Order under section 10 to enable them to acquire scheduled land for gas-works purposes; to raise additional capital; to make further provisions with regard to the supply of gas; and for other purposes.

HAYWARD'S HEATH DISTRICT GAS COMPANY.

The Annual General Meeting of the Company was held on Friday, April 3—Mr. E. C. Charleton, Chairman, presiding.

In the report for the year ended Dec. 31, it was stated that the balance of the profit and loss account was £6267. It was proposed to pay a final dividend at the rate of 7½ p.ct. per annum on the 5 p.ct. consolidated stock for the half-year to Dec. 31, making 7½ p.ct. (less income-tax) for the year. The balance to be carried forward was £4242.

The Chairman, in moving the adoption of the report and accounts, said that the total quantity of gas sold during the year was over 77 million c.ft.—an increase over 1923 of 11·8 p.ct. During the year the price of gas had been reduced by 1d. per therm. Rental of meters and fittings showed a satisfactory increase. The Directors had placed a further £500 to the contingency account, bringing it up, with reserve, to the satisfactory figure of £4200. The repairs suspense account had also been added to, to the extent of £500. Negotiations which had spread over a number of years in a rather desultory manner with the Cuckfield Gas Company, for the purchase of the latter's undertaking, reached a satisfactory conclusion; and a purchase figure was agreed upon. The undertaking was taken over on Jan. 1, 1925. The satisfactory results obtained by their Company were due to a large extent to the ability of their Engineer, Manager, and Secretary, Mr. A. E. Whitcher.

At the conclusion of the annual meeting an extraordinary general meeting was held for the purpose of passing resolutions authorizing the Directors to raise a sum not exceeding £23,500 by the issue of debenture stock.

The Chairman, in moving the resolution, said it was only right that they should pay by capital for the Cuckfield Company; and as they had to supply Cuckfield, it would be necessary to erect another gasholder.

The resolution was carried.

The Hereford City Council have approved of a recommendation of the Gas Committee to borrow the sum of £3500 for the purpose of installing prepayment supplies.

LONDON COUNTY COUNCIL AND THE PRICE OF GAS.

At last week's meeting of the London County Council—Captain O. E. Warburg (Chairman) presiding—Mr. M. H. Davis (Whitechapel and St. George's) asked the Chairman of the Public Control Committee the following questions:

Commercial Gas Company.

(1) Whether his attention has been called to the fact that the Commercial Gas Company intend increasing the price of gas supplied by them, as from Lady Day, by as much as 2·85d. per 1000 c.ft., thereby bringing the price of their gas to as much as 3s. 8·65d. per 1000 c.ft.?

(2) Whether he is aware that one of the remarkable reasons given for the increase is that the price obtainable for coke has dropped?

(3) In view of the fact that the area supplied by the Company includes a large number of poor people, who will be severely hit by such increase, will he state what steps the Committee intend to take in the matter?

Mr. Cyril H. M. Jacobs (Clapham), the Chairman of the Public Control Committee, said in reply:

(1) The answer to the first question is in the affirmative.

(2) The increase is stated to be due to a reduction in the prices obtainable for residual products (coke, tar, and ammonia), and to increases of wages. The same reasons have been given by other gas companies for increases of price to be made as from Lady Day. There is nothing remarkable in the reasons given for the rise in price, as, owing to the increased production in the mining areas of France and Germany, a drop in the price of coke has actually occurred.

(3) The Council in 1924 made an application to the Board of Trade under the Gas Regulation Act, 1920, for the reduction of the standard price of gas applying to the Commercial Gas Company, in view of the fall in cost of production in recent years; and the standard price was accordingly reduced, as from June 30, 1924, from 15·4d. per therm to 11·4d. The effect of this reduction was that the authorized dividends payable by the Company were considerably reduced. The Company are within their statutory rights in increasing the price of gas, and no further action by the Council is possible in the present circumstances. By means of the sliding-scale, however, the interests of the shareholders are identified with those of the consumers; and the present increase in price will automatically involve a reduction of the dividends payable for the current year.

Mr. Davis: Can I ask the Chairman of the Public Control Committee when the increase in the wages of the workmen will take place?

Mr. Cyril Jacobs: I cannot answer that question. I do not know.

South Metropolitan Gas Company.

On the presentation of the report of the Public Control Committee relating to the South Metropolitan Gas Company's basic price, which was reproduced on p. 131 of the last issue of the "Journal,"

Mr. J. D. Gilbert, D.L., J.P. (Central Southwark), said he wanted to raise a point as to whether anything further could be done beyond what was reported by the Committee. It was reported that the South Metropolitan Gas Company were increasing the price of gas from 8d. to 8¾d. per therm. To the small consumers, and to a great many of the consumers who used the slot meter, he believed this would work out at an even higher rate than the 8¾d. per therm. He would like to ask the Chairman whether, in conjunction with this report, he had had any report as to the great slump in the price of coal which had occurred during the last fortnight. The price of coal had slumped very considerably—almost as much as from 3s. to 4s. a ton in some cases—and in view of this he would like to ask the Committee to consider whether the Gas Company were entitled to increase the charge for gas to the price they now proposed. There was a general impression outside the Council that there was some kind of appeal from a gas company's prices to the County Council. From this report, he did not gather that the Committee had dealt with that matter. Was there any method by which consumers could have the right of appeal to the Council as to whether the prices charged, not only by this particular Company, but by all other gas companies in London, were right and legal? If it was so, he thought it would be found that a good many consumers in South London would take advantage of the opportunity to come to the Council to know whether the Company were entitled to make this extra charge.

Mr. Cyril Jacobs replied that perhaps it would be well if he explained the different position of the South Metropolitan Company from that of other large companies who supplied in the London area. Whereas the South Metropolitan Company came under their own Act of 1920, all the other companies came under the Gas Regulation Act of the same year. At the instigation of the Council, applications were recently made to the Board of Trade for a revision of the standard or basic price in respect of the four largest Companies. The case of the South Suburban Gas Company was under consideration at the present moment. As a result of inquiries made by the Board of Trade, the standard price in pence per therm was reduced in each instance, as follows:

	Pence per Therm.
Gas Light and Coke Company . . .	from 15·2 to 11·0
Commercial Gas Company	,, 15·4 ,, 11·4
Wandsworth Gas Company	,, 16·6 ,, 14·0
Brentford Gas Company	,, 17 8 ,, 14·0

It would be noticed that the lowest standard price was fixed in respect of the Gas Light and Coke Company in 1924, and that this price was 11d. per therm. Under the South Metropolitan Gas Act of 1920 the standard price was fixed by Parliament at 11d. per therm—exactly the same as the lowest price fixed by the Board of Trade, in respect of the Gas Light and Coke Company—and in that Bill the Council had the right to go to Parliament in the present session to ask for a revision of the standard or basic price.

Mr. Gilbert: The Council or the Company?

Mr. Jacobs: The Company have to go, and the Council have a right to contest it. Continuing, he said that the Comptroller had conducted a very full inquiry into this question, which had been the subject also of a special meeting of the Public Control Committee. It appeared desirable that the statutory basic price should be brought into line with present costs; and action was being taken with a view to effecting this in connection with the Company's Bill now before Parliament. At Michaelmas, 1922, the South Metropolitan Company were charging 11¾d. per therm for their gas, but by Michaelmas, 1923, had reduced it by various stages to 8d. The Company were now giving notice of an increase of price by ¾d. per therm, and one could presume that this was to make income balance with expenditure. The Commitee were advised by the Council's officers that in their opinion the Company were quite justified, in the present circumstances, in making this increase. The price of gas must always be determined by the cost of production, and—another very important point—by the prices obtained by the sale of coke and other bye-products from the manufacture of coal gas. They had been told that there was going to be an increase in wages; and he understood that this was going to take place from the 1st of next month. It had been established that these Companies were receiving very much lower prices by the sale of their coke and other residuals, owing to the increase of mining and trade developments in France and Germany. He thought they must therefore be prepared for a general small increase in the price of gas in the near future. The interests of the consumers were adequately protected by the sliding-scale, under which the dividends payable were limited to a fixed figure so long as the price charged for gas was not less than the standard price fixed by Parliament; and the payment of any additional dividends must be accompanied by a proportionate reduction in the price charged for gas. By means of the sliding-scale, the interests of the shareholders were identified with those of the consumers; and it was in the interest of the Company, no less than in that of the consumer, that the price should be kept down.

The report was received.

Birmingham Gas Department.

The Birmingham Gas Committee in a report to the City Council refer to the subject of gas supplies to small house property in courts and terraces. Considerable progress had been made in the lighting of courts and passages themselves, and in the provision of slot meter installations, though there were still many courts, particularly in the poorer parts of the city, which had no gas supply. There was less reluctance on the part of landlords to pay the cost of "carcassing" a house with internal piping, which costs, on an average, about 45s. per house. In 1922, 370 such houses were dealt with; in 1923, 535; and in 1924, 1155. Housing developments were sufficient to keep all the available gasfitters fully employed, and the Gas Committee considered it would be unwise to contribute further towards the cost of installing gas in existing small house property. The present practice is for the Department, at their own expense, to lay the main supply pipe from the street, after a house has been "carcassed;" and a concession is also made in the cost of the service pipe therefrom to the meter—only a nominal sum of 2s. 6d. per house being charged against the property owner. By arrangement, however, the cost of installations to property owners may be spread on the instalment principle over a period not exceeding five years. Branch depôts and offices are to be opened at Acocks Green and Erdington, and at each a number of gasfitters and one or two clerks will be stationed. A recommendation is made by the Gas Committee in favour of the purchase of six small Wolseley two-seater motor cars for the use of mains inspectors.

Wells Gas Light Company.—Messrs. A. & W. Richards have been instructed by the Directors of the Company to offer for sale by tender £8000 6½ p.ct. irredeemable preference stock; the minimum price being par. It will have been seen from the announcement appearing in our advertisement pages that tenders should be forwarded to Messrs. Richards, No. 37, Walbrook, E.C. 4, not later than eleven o'clock on Tuesday, April 21.

Bridgwater Gas Light Company.—When reporting the results for the year 1924, the Directors were able to point to an increase of about 2⅝ million c.ft. in the sales of gas, and to a further reduction to 11·11d. per therm (or 4s. 2d. per 1000 c.ft), which is less than 40 p.ct. above the pre-war charge. At the meeting, the Chairman (Mr. R. Y. Foley) remarked that the results were again very satisfactory; over 15,100 c.ft. of gas being made per ton of coal carbonized. Mr. Cornish, Jun., has been appointed Works Manager; while Mr. J. H. Cornish continues to render valuable service to the Company as Manager and Secretary.

Torquay and Paignton Gas Company.—Presiding at the annual general meeting of the Company, Major R. P. Kitson (Chairman of Directors) said the revenue account fully justified the amalgamation between the Torquay and Paignton Companies. The sales of gas had increased wonderfully—the total increase for the year being 31 million c.ft. No fewer than 369 millions had been sold. The necessary plant for effecting and carrying on the entire manufacture of gas at the Hollacombe Works would be in complete operation before the next annual meeting. The increased demand for gas showed every sign of continuing, as the district was rapidly developing in all directions. With regard to residuals, it was satisfactory to note that the sales under this heading had realized 64 p.ct. of the cost of coal. Continued progress was also received in the sale of fittings. The shareholders and the public would shortly receive notice of the intention to issue for sale by tender debenture stock in the Company. The accounts, which showed a disposable balance of £21,688, were passed, together with a dividend at the rate of 6 p.ct. per annum upon the ordinary stock, less income-tax.

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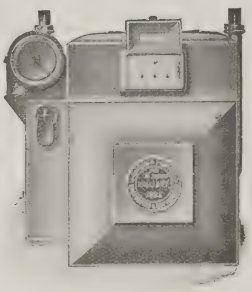

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NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

There is an entirely featureless market, with holiday conditions and continued absence of forward inquiry.

Wear Special makes indicate 20s. f.o.b., and best qualities 19s. 6d. to 20s. Seconds and others are 17s. to 17s. 3d

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

The situation in the coal trade in Yorkshire and Lancashire remains practically unaltered from that of last week. Gas coals are moving steadily under contract. Prices are also about the same. For prompt account, best hards have been sold at 19s. 3d. to 19s. 6d. per ton f.o.b., and secondary sorts showed little recovery from the depression. There is no improvement in the export sections, Continental competition remaining keen. Washed doubles are quoted at about 17s. to 17s. 6d. per ton f.o.b., and singles about 17s. 6d. The home inquiry for all kinds of industrial fuel remains small.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

A very gloomy view is taken of the outlook in the Midland coalfields, on account both of the immediate effects of a shrunken turnover and the large implications of the crisis in an economic sense. It is feared it must prove disastrous for many of the less favourably situated undertakings, and seriously aggravate unemployment. A decision has been taken to close the Great Wyrley Colliery—till recent years one of the most prosperous mining properties on Cannock Chase. The pitmen to the number of about 640 have received notice to terminate their engagements this week. Future policy is being anxiously considered by a great many managements, since it is evident that unless demand expands, of which there is little expectation at present, collieries which are relatively expensive to work, and which have no sufficient non-competitive distributive radius, cannot hope to hold their own against big concerns with rich deposits worked with all the labour-saving resources of modern equipment.

The market for gas coal is stagnant and featureless. Steams and all qualities of industrial fuel are in abundant supply. The trade has been very inactive during the past fortnight. Very little coal is being raised this week. With considerable stocks in hand, the resumption will be irregular. Market values are very unstable.

CONTRACTS OPEN.

Coal.

The Directors of the Otley Gas Company are inviting tenders for the supply of 5000 to 7000 tons of best screened gas coal or nuts. [See advert. on p. 194.]

EXTENSIONS.

New Retorts for Oswaldtwistle.

The Oswaldtwistle Gas Committee are applying to the Ministry of Health for sanction to borrow £21,000 for new retorts.

Light and a Shopping Week.—At a special meeting of all traders interested in a shopping week proposal at Bradford, held under the auspices of the Bradford Chamber of Trade, Mr. S. H. Packer, Sales Manager to the Bradford Corporation Gas Department, strongly supported the proposal, and said his Department would help in every way possible. He suggested that the period should be a fortnight, instead of a week; and in this proposal he was supported by several other speakers. At the same meeting Mr. C. E. Allsopp, Sales Manager to the Bradford Electricity Department, said he believed traders for that period would be allowed electricity for lighting at 1½d. per unit (the present price charged for window lighting after shop hours), instead of the normal price of 7d. per unit.

Illuminated Signs Association.—An Association of Users and Manufacturers of, and Traders in, Illuminated Signs has been formed, with offices at No. 25, Victoria Street, Westminster, "to watch the proceedings of Parliament and Government Departments for the purpose of protecting the interests of its members against restrictive legislation; to safeguard those interests against excessive rating and prohibitive by-laws proposed by local authorities; and to take action in matters of a legal character in which its members may be involved within the functions of the Association." The Association is opposing the action of a municipal authority in seeking powers to prohibit the use of illuminated signs, since, if these powers are obtained by one Corporation, other local bodies will make similar applications, with the result that the industry will be completely crippled, and a valuable advertising medium lost.

Devon Gas Association.—The 19th annual meeting of the Association was held on April 2, at Exeter. The Chairman (Mr. F. T. Depree, J.P.), in moving the adoption of the report, said that during the year the price of gas had been generally reduced, but the increase in output had more than made up for this. The Moretonhampstead Works had recently been much improved by the addition of new storage accommodation and carbonizing plant, while the freehold of the site had been acquired. Perhaps the most important event of the year was the acquisition of the Ivybridge gas undertaking. This was situated in a thriving district, and he looked forward to its becoming a valuable addition to the Association. The decrease in the value of all gas-works residuals was a matter of some concern in the coming year; but he hoped that it would not be necessary to increase the price of gas. Mr. R. I. Rew, seconding, referred to the structural improvements and additions to the various plants at their several works. The report was adopted, and a 7½ p.ct. dividend, less income-tax, was declared.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *April* 13.

Business in the London tar products market is very quiet at present, which is to be expected during the holiday week. Prices are unchanged.

Tar Products in the Provinces.

April 14.

Markets generally remain dull, and there is nothing of interest to report.

Pitch is still neglected. Some business has been done on the Continent on the basis of 40s. f.o.b. U.K. ports; while South Wales have refused offers at equal to 35s. f.a.s. Manchester. The present low price makes forward business impossible. Consumers refuse to pay any advance on prompt prices; while makers, quite naturally, feel they can do no harm by waiting.

Creosote is quiet, but the undertone is steady; and it is confidently expected that before long export orders for July-December will come into the market.

Benzoles are steady, solvent naphtha firm, carbolic and cresylic dull, and naphthalene and anthracene almost unsaleable.

The average values for gas-works products during last week were: Gas-works coal tar, 28s. 6d. to 33s. 6d. Pitch, East Coast, 40s. to 41s. f.o.b. West Coast—Manchester, 35s. to 30s.; Liverpool, 30s. to 37s.; Clyde, 39s. to 40s. Benzole, 90 p.ct., North, 1s. 6½d. to 1s. 7½d.; crude, 65 p.ct., at 120° C., 7½d. to 8¼d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 6½d. to 1s. 7½d. Toluole, naked, North, 1s. 6d. to 1s. 7d., nominal. Coal-tar crude naphtha, in bulk, North, 7¾d. to 8¼d. Solvent naphtha, naked, North, 1s. 5d. to 1s. 6d. Heavy naphtha, North, 1s. to 1s. 2d. Creosote, in bulk, North, liquid, 6¾d. to 6¾d.; salty, 6d. to 6¼d.; Scotland, 5⅞d. to 6¼d. Heavy oils, in bulk, North, 6¼d. to 7d. Carbolic acid, 1s. 5d. to 1s 6d. prompt. Naphthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality 2½d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Social Side of Messrs. W. J. Jenkins & Co., Ltd., Retford.

Much has been written on the primary duty of employers in every industry to diffuse the proper atmosphere of sociability and goodwill around their managerial staff and employees, and quite a lot of valuable data have been compiled from large concerns where this atmosphere has been created. Fortunately it requires little search to recognize the chief factors which go so far towards completing this most desirable unity. Three of them are undoubtedly the spirits of recreation, sport, and harmony. The times demand that work and play shall run hand in hand; and the really modern employer—keen psychological student that he usually is—fully recognizes this combination, and gives the matter his wholehearted support. An example of this was recently to be found in the Town Hall, Retford, when a delightful evening was spent under the auspices of the Beehive Works Sports Club of Messrs. W. J. Jenkins & Co., Ltd. Nearly 800 were present at the entertainment, which was of an unusually high order, and was provided by the members of the Social Section in the form of an original revue entitled "The Belles of Honolulu" or "The Blue Lagoon." This revue was specially written and produced by a talented member of the staff, who was also responsible for the painting of the beautiful scenery, kindly presented by the management. The artistes were mainly drawn from the various departments and workshops of the firm. The consensus of opinion was that it was one of the most brilliant and inspiring shows ever put on the local platform. After the revue, there was dancing.

Increased Consumption at Oldbury.—At a meeting of the Oldbury District Council last week, Mr. K. H. Wilson (the Chairman of the Gas Committee) referred to the fact that during the year ended March 31 210 million c.ft. of gas had been consumed, compared with 191 million c.ft. in the previous year—an increase of over 10 p.ct.

Australian Gas Light Company.—It has been decided by the Directors to dispense with the printing of a half-yearly balance-sheet and report, and to substitute for them an annual balance-sheet and report for the Company's year ending June 30, for presentation at the statutory annual meeting to be held in August. A dividend of 4 p.ct. for the past six months was declared, leaving a balance to be carried forward of £50,530.

Prepayment Consumers at Glasgow.—Councillor Hanlon has given the Glasgow Corporation Gas Committee notice that, at the next meeting, he will move: "That it be remitted to a Special Sub-Committee to consider and report as to the advisability of increasing the number of prepayment meters already in use, or alternatively considering some means of restoring the supply to householders who have had the supply cut off through inability to pay their gas accounts."

Reduction in Price at Neath.—The Neath Town Council, at their last meeting, adopted a recommendation of the Gas Committee to reduce the price of gas, as from the March quarter readings, by 1d. per therm (equivalent to 4¼d. per 1000 c.ft.). This reduction follows upon one of 2·1d. per therm (equivalent to 8·925d. per 1000 c.ft.) which came into operation as from the March quarter readings, 1924. During the past year, the Neath Gas Department have closed down the Briton Ferry Works, which were taken over at the time of the Neath borough extension; and the whole of the gas for the extended area is now being supplied from the Neath Works. These works have been considerably remodelled and extended during the past three years; and the economies effected are now showing in the reduced price for gas. A Sports and Recreation Club has recently been organized; and the work of laying down a bowling green, tennis court, &c., on the spare land adjoining the gas-works is being proceeded with. A recreation room, including mess room, bath room, &c., was formally opened by the Mayor about three weeks ago.

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STOCK MARKET REPORT.

The only redeeming feature on the Stock Exchange last week was the success of the new issues. The principal of these was the Municipality of Danzig loan for £1,500,000, which was considerably over-subscribed. A premium of 1⅞ was quoted at first, but the efforts of the "stags" to unload before the holidays brought this down rapidly to ¾ premium. There were several other issues, including the London County Freehold and Leasehold Debentures and the Burndept Wireless Preferred shares, all of which, being regarded as fairly good purchases, were successfully floated. Otherwise, with perhaps the exception of the usual popular shares, there was a total lack of business; the public, intent on holidays, giving little attention to stocks and shares.

The outlook is still dominated by the position in France, which is very uncertain, and it is not relieved by the announcement at the week-end of the Premier's resignation, the effect of which will doubtless be noticeable when the markets reopen. It is feared the news will accentuate the present depression, especially on the Foreign Market.

In the Gas Market there was no exception to the general rule, although there were fewer changes in the quotations. Gas Light ordinary fell another 1⅛ points to 86-89. The announcement of the Company's intention to raise the price of gas as from June next, bringing in its train a reduction in the authorized dividend, will not tend to improve the price. It must be remembered, however, that a reduction of dividend is not compulsory until February of next year, when, subject to the price of gas not having been still further increased, the authorized rate payable will be £4 17s. 4d. p.ct. per annum, which is the same rate that was paid immediately pre-war.

The Commercial Gas stocks are now quoted at 88-91 and 87-90 for the 4 p.ct. and 3½ p.ct. stocks respectively. The authorized dividends on these stocks payable in August next are £5 6s. 8d. and £5 3s. 4d. p.ct. per annum, which rates are slightly less than the pre-war dividends.

The following transactions were recorded during the week:

On Monday, Aldershot "C" 78¼, 4 p.ct. preference 72½, Commercial 3½ p.ct. 87. Continental Union 7 p.ct. preference 90¼, East Hull (5 p.ct. max.) 86½, 86⅞, Gas Light and Coke 88½, 88⅞, 88⅞, 89, 89¼, 4 p.ct. preference 78⅞, 79½, 3 p.ct. debenture 60, 61. Imperial Continental 180, 181, Primitiva 8s. 0d., 8s. 0½d., 8s. 10½d., 8s. 11½d., 4 p.ct. debenture (1911) 63½, South Metropolitan 94½, 95¼, Tottenham "A" 118½, "B" 98, 99. Supplementary prices, Brentford 6 p.ct. mortgages 100.

On Tuesday, Aldershot "C" 78¼, 79½, Alliance and Dublin 66½ *ex* div., Brighton and Hove 169, 170, Bristol (5 p.ct. max.) 93½, British 112, Commercial 4 p.ct. 88, 3½ p.ct. 87, 3 p.ct. debenture 58⅝, 60, Continental Union 37, European 7⅜, Gas Light and Coke 88⅛, 88⅛, 88⅞, 89¼, 89⅝, 3½ p.ct. maximum 63, 63½, 63⅜, 3 p.ct. debenture 60, 60⅛, 60⅞, 61, Imperial Continental 179½. Primitiva 8s. 0d., 8s. 7½d., South Metropolitan 94½, 95¼, 6½ p.ct. debenture 103, South Suburban 5 p.ct. 98, 101½. Supplementary prices, Dover 5¼ p.ct. debenture 102½, 102⅝, Hartlepool 5 p.ct. maximum 89⅜, Wandsworth 3½ p.ct. new 95.

On Wednesday, Aldershot "C" 70½, Bombay 5½, £5 3s., Commercial 4 p.ct. 87, 3½ p.ct. 87, European 7⅛, Gas Light and Coke 88⅜, 88½, 88⅞, 89, 89¼, 4 p.ct. preference 78½, 79⅛, Imperial Continental 179, 180, Primitiva 4 p.ct. debenture (1911) 64½, South Metropolitan 94½, 3 p.ct. debenture 60½, 61½. Supplementary prices, Dover 5¼ p.ct. debenture 102½, 102½, North Middlesex 5 p.ct. preference 90½, 91.

On Thursday, Bombay 5¼, Bournemouth "B" 12⅜, Continental Union 36⅛, Gas Light and Coke 87, 87⅛, 88, 88⅛, 88⅜, Imperial Continental 180½, 182, 182½, Montevideo 65⅝, Primitiva 4 p.ct. debenture 64, 65, South Metropolitan 95, 95¼, Wandsworth "B" 113⅜, 114. Supplementary prices, Liverpool 5 p.ct. 87½, Newport (Mon.) 5 p.ct. maximum 84, Wandsworth 5 p.ct. preference 95.

The Money Market also bore signs of the holiday atmosphere, and rates were quiescent. Discount quotations were possibly easier, due doubtless to the low rate at which Treasury Bills were allotted. The average rate was £4 3s. 4·18d. p.ct., or 2s. 3d. below that for the previous week. The new Treasury Bills were dealt in at 4½ p.ct. Money was fairly plentiful on Thursday, and rates for fresh accommodation declined to 3 p.ct., but rather tighter conditions prevailed on Saturday.

In the Foreign Exchange Market on Thursday the Paris cheque moved against France, rising at one time to 93.40; but on Saturday, in spite of the political disturbances, the rate improved to 92.45 to the £. Belgian francs moved in sympathy to 94.45. Sterling on New York was weaker at 4.76⅛ dollars, and Italian lire rather cheaper to 116.40.

The Silver Market was quiet, the price for cash being 31½d. per oz. Gold was 1d. down on the week at 86s. 5d. per oz.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on March 5. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3¼ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Apl. 9.	Rise + or Fall − on Week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 5	5	5	Aldershot 5 p.c. max. C. .	78–81	..	78¼–79⅛
295,492	,,	,,	4	4	Do. 4 p.c. Pref. . .	71–76	..	72½
1,551,868	,,	Apl. 2	6¼	6¼	Alliance & Dublin Cons. .	66–71	+1	66⅝
374,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb. . .	63–68	..	..
300,000	5	Oct. 23	8	8	Bombay, Ltd.	5–5¼	..	5⅛–5⅛
100,000	10	Mar. 5	8⅛	8⅛	Bournemouth 5 p.c. . .	12–13	..	..
425,050	10	,,	7	7	Do. B 7 p.c.. .	12½–12⅝	..	12⅜
150,000	10	,,	6	6	Do. Pref. 6 p.c..	11–12	+⅜	..
50,000	Stk.	Jan. 8	3	3	Do. 3 p.c. Deb..	56–59	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb..	76–79	..	..
992,045	,,	Mar. 5	6⅛	6⅛	Brentford A Con. . . .	100–105	..	..
990,500	,,	,,	6⅜	6⅜	Do. B New	100–105	..	..
76,000	,,	,,	5	5	Do. 5 p.c. Pref. . .	95–98	..	..
306,690	,,	Dec. 18	4	4	Do. 4 p.c. Deb. . .	76–81	..	..
181,337	,,	,,	6	6	Do. 6 p.c. Rich. Red. Deb.	100–105	..	..
214,740	,,	Mar. 5	11½	12½	Brighton & Hove Orig. .	168–170	..	169–170
240,200	,,	,,	8⅝	9⅛	Do. A Ord.	122–125	..	..
1,287,500	,,	Feb. 19	4	5	Bristol 5 p.c. max.. . .	96½–97½*a*	..	93⅛
855,000	,,	Mar. 19	8	7	British Ord.	112–117*	..	112
100,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref.. .	123–128	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb..	72–77	..	..
100,000	10	Dec. 18	8	6	Cape Town, Ltd. . . .	7–8	..	..
100,000	10	Nov. 6	4½	4½	Do. 4½ p.c. Pref.. .	6–7	..	..
150,000	Stk.	Dec. 18	4½	4½	Do. 4½ p.c. Deb.. .	71–76	..	..
626,860	,,	Feb. 19	6	6	Cardiff Con. Ord. . . .	101–104	..	..
237,860	,,	Jan. 8	7½	7½	Do. 7½ p.c. Red. Deb..	104–107	..	..
157,150	,,	Feb. 19	5	6½	Chester 5 p.c. Ord. . . .	89½–94½	..	..
1,513,280	,,	Mar. 5	6	5/14/8	Commercial 4 p.c. Cap. .	88–91	−2	87–88
560,000	,,	,,	6	5⅝	Do. 3½ p.c. Cap. .	87–90	−2	87
475,000	,,	Dec. 18	3	3	Do. 3 p.c. Deb. . .	57–60	..	58⅝–60
800,000	,,	14 Jan. 15	—	—	Continental Union, Ltd. .	37–42	..	36⅜–37
200,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref. . .	88–92	..	90⅝
680,000	,,	Mar. 5	6½	6½	Croydon sliding scale . .	100–103	..	..
284,975	,,	,,	5	5	Do. max. div. . . .	83–86	..	..
492,270	,,	Feb. 19	6	9	Derby Con.	110–112*c*	..	..
55,000	,,	Jan. 8	4	4	Do. Deb.	74–76*c*	..	..
1,002,180	,,	Jan. 22	6	4	European, Ltd.	7–8	..	7⅛–7⅜
16,460,070	Stk.	Feb. 19	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	86–89	−1⅛	87–89⅛
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max. .	62–65	..	63–63⅝
4,062,235	,,	,,	4	4	Do. 4 p.c. Con. Pref.	78–80	..	78¼–79⅛
4,761,930	,,	Dec. 18	3	3	Do. 3 p.c. Con. Deb.	59–62	..	60–61
130,000	,,	—	10	10	Do. 10 p.c. Bonds . .	..	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Red. Deb.	..	..	..
82,500	,,	Mar. 19	6½	6½	Hastings & St. L. 5 p.c. Conv.	92–97*	..	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	73–78*	..	..
70,000	10	Sept. 25	10	10	Hongkong & China, Ltd. .	16–17	..	..
86,600	Stk.	Mar. 5	10	10	Hornsey 7 p.c.	138–143	..	..
1,976,000	,,	Nov. 20	30	10	Imperial Continental Gas. .	179–184	..	179–182½
263,950	,,	Feb. 5	3½	3½	Do. 3½ p.c. Red. Deb.	71–74	..	..
235,242	,,	Mar. 19	6½	6½	Lea Bridge 5 p.c. Ord.. .	96–101*	..	..
2,127,340	,,	Feb. 19	5½	5½	Liverpool 5 p.c. Ord. . .	87½–88⅛*b*	..	87½
600,000	,,	Mar. 19	7	7	Do. 7 p.c. Red. Pref.	101–103*b*	..	..
165,736	,,	Feb. 19	9	8	Maidstone 5 p.c. Cap. . .	122–132	..	..
63,480	,,	Dec. 18	3	3	Do. 3 p.c. Deb. . .	54–59	..	..
75,000	5	Dec. 4	7	5	Malta & Mediterranean . .	4–4¼	..	..
541,920	Stk.	Nov. 20	4	4	Montevideo, Ltd. . . .	62–67	..	65⅝
2,061,315	,,	Mar. 5	5	5	Newcastle & Gateshead Con.	80–81*d*	..	..
300,929	,,	,,	4	4	Do. 4 p.c. Pref..	74⅜–73¾*d*	..	..
529,795	,,	Dec. 18	3½	3½	Do. 3½ p.c. Deb.	68–69d	..	..
15,000	10	Mar. 5	11	12	North Middlesex 10 p.c. .	..	..	..
75,940	10	,,	7⅞⅞	8⅝	Do. 7 p.c. .	..	..	..
300,000	Stk.	Dec. 4	7	9	Oriental, Ltd.	102–107	..	..
188,120	,,	Jan. 8	7⅛	7⅛	Plym'th & Ston'house 5 p.c.	109–114	..	..
60,000	50	Mar. 5	13	14	Portsea Island Gas . . .	96–99	..	..
100,000	50	,,	12	13	Do. C	93–98	..	..
2,289,999	1	—	—	—	Primitiva Ord.	8/3–9/3	..	8/6–8/11½
311,100	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb.. .	79–81	..	..
600,000	Stk.	Jan. 22	4	4	Do. 4 p.c. Red. Deb. 1911	63–65	..	64–65
220,335	,,	Dec. 18	4	4	Do. B Aires 4 p.c. Rd. Db.	65–67	..	..
321,070	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	65–67	..	..
150,000	10	Mar. 19	6	6	San Paulo 6 p.c. Pref. . .	7⅞–8⅛	..	..
125,000	50	Jan. 2	5	5	Do. 5 p.c. Red. Deb.	43–46	..	..
270,000	Stk.	Mar. 19	5½	5⅝	Sheffield A	102–104*e*	..	..
419,968	,,	,,	5⅝	5⅝	Do. B	102–104*e*	..	..
1,040,000	,,	,,	5⅝	5⅝	Do. C	102–104*e*	..	..
90,000	10	Oct. 23	8	6	South African	7–9	..	..
6,609,895	Stk.	Feb. 19	5	6½	South Met. Ord.. . . .	94–95	..	94⅛–95⅛
1,895,445	,,	Jan. 8	3	3	Do. 3 p.c. Deb. . .	59–62	..	60⅜–61⅛
734,000	,,	Mar. 5	6½	6½	Do. 6½ p.c. Red. Deb.	104½–104⅝	..	103
900,000	,,	Mar. 5	8⅛	8⅛	South Shields 5 p.c. . .	135–136*d*	..	..
1,187,795	,,	Feb. 19	6½	6½	South Suburban Ord. 5 p.c.	98–103	−1	98–101½
368,837	,,	Dec. 18	5	5	Do. 5 p.c. Deb. . .	97–100	..	..
647,740	,,	Nov. 6	5	5	South'mpt'n Ord. 5 p.c. max.	83–86	..	..
121,275	,,	Dec. 18	4	4	Do. 4 p.c. Deb. . .	72–77	..	..
350,000	,,	Mar. 5	7	7	Swansea 7 p.c. Red. Pref. .	101–103	..	..
200,000	,,	Dec. 18	6½	6½	Do. 6½ p.c. Red. Deb..	103–105	..	..
120,000	,,	Feb. 19	8	8	Tottenham District A 5 p.c.	116–119	..	118½
882,275	,,	,,	6½	6½	Do. B 3½ p.c. .	98–101	..	98–99
181,255	,,	Dec. 18	4	4	Do. 4 p.c. Deb. . .	75–79	..	..
258,251	,,	Mar. 19	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, &	77–79*d*	..	..
197,294	,,	Feb. 19	6⅞	6⅞	Wycombe 5 p.c.. . . .	100–105	..	..
88,330	,,	,,	5	5	Do. 5 p.c. pref. .	93–98	..	..
91,800	,,	,,	—	6½	Do. 5 p.c. Maidenh'd	90–95	..	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Mar. 5	9½	9½	Wandsworth A 5 p.c. .	135–140	..	..
255,636	,,	,,	7⅛	7⅛	Do. B 3½ p.ct. .	113–118	−1	113¾–114
392,955	,,	,,	6/9/6	6/9/6	Do. C and New	97–102	..	95
352,000	,,	,,	7⅛	7⅛	Wimbledon 5 p.ct. . .	109–114	..	..
98,000	,,	,,	7⅛	7⅛	Epsom 5 p.ct.. . . .	117–122	..	..
88,416	,,	Dec. 18	3	3	3 p.c. Deb.	57–60	..	..

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Infringing the Municipal Corporations Act.—Mr. S W. B. Stephen, the Chairman of the Gas Committee of the Smethwick Town Council, who was recently disqualified through having dealings in coke with the Gas Department, has again been elected to the Town Council.

Leamington Priors Gas Company.—Presiding at the annual meeting of the Company, Dr. Harold Mason expressed the opinion that the reduction in the price of gas, bringing it down to 8¾d. per therm, had been justified. This was shown by an increase of 3½ million c.ft. in gas sales. They were recommending the payment of the usual dividends, but they had had to reduce their carry-forward.

An Address on Gas Undertakings.—At a recent meeting of the Dudley Rotary Club, Mr. G. E. Ashurst, Secretary of the Dudley Gaslight Company, read a paper on "The Distinctive Features of Statutory Undertakings, with special reference to Gas Undertakings." Mr. Ashurst, in the course of his remarks, referred to the popularity of gas for public street lighting, mentioning that a census of 1000 cities and towns in the United Kingdom resulted as follows: Out of 670,300 lamps, 585,600 were gas—or 87 p.ct.

Tavistock Lighting, Coal, and Coke Company, Ltd.—At the annual meeting of the Company—Mr. T. Doidge presiding—the report of the Directors stated that the output of gas had increased, and that the sales were 9 p.ct. above those for 1923. Residuals also had yielded a satisfactory return. The mains in various parts of the town had been enlarged to meet the increasing requirements. The balance at the credit of the profit and loss account, after providing for income-tax and the payment of an interim dividend, was £1081. The report and statement of accounts were adopted. It was resolved that a final dividend be declared at the rate of 4 p.ct. (less income-tax) for the half-year ended Dec. 31, 1924, on the original capital, and £2 16s. p.ct. on the additional capital.

Limerick Gas-Works Improvements.—The Free State Ministry of Industry and Commerce have informed the Limerick Corporation, in relation to the latter's application for a loan of £30,000 for carrying-out improvements in the city gas concern, that the men displaced by the introduction of new machinery will have their claims for compensation favourably entertained by the Ministry, and that it is the intention of the Local Government Ministry to introduce legislation empowering local authorities to make provision for granting pensions to employees in the gas and other sections. The Corporation Law Adviser reported on his interview with the Minister in regard to the men who would be unemployed through the gas-works improvements, and said they would receive gratuities and pensions. This was considered satisfactory.

Lighting at Northampton.—At a recent meeting of the Northampton Corporation Highways Committee, the Borough Engineer submitted communications from the Northampton Gaslight Company on the question of street lighting. The Company pointed out that at present 1304 public street lamps were lighted, and the annual costs (£6044) were proportionately high as compared with the cost of lighting the whole of the lamps in the borough—viz., 1764. The cost of lighting the 1764 lamps would be £7757; but in the event of such lamps being lighted, the Company were prepared to reduce the annual charge to £7150. They also suggested that a new contract for a period of seven years (instead of five, as at present) should be entered into. The Committee resolved that a contract in accordance with the terms set out above should be made.

Further Capital for the Barnet Company.—The Directors of the Barnet District Gas and Water Company are inviting tenders for £15,000 of "D" capital gas stock, ranking equally with the existing similar capital now receiving the maximum dividend of 7 p.ct. per annum. The minimum price of issue is £110 per £100. Tenders must be received by the Secretary of the Company, at No. 139, Cannon Street, E.C., not later than Monday morning, April 20.

Gas Light and Coke Company's Price Increase.—The Directors of the Gas Light and Coke Company regret to have to announce that the price of gas throughout the Company's district will be increased from 8·6d. per therm (3s. 7d. per 1000 c.ft.) to 9·4d. per therm (3s. 11d. per 1000 c.ft.), as from the date of recording the meter indices for the June quarter. This advance in the price of gas will necessitate a reduction in the Company's dividend. The price of the Company's gas was steadily reduced from the end of 1921 till June, 1923, when it reached its present low figure; and an increase in the price is now rendered necessary by the serious reduction in the revenue derived from coke and other residual products, and by the increase in wages paid since the beginning of the present year. The consumers are assured that the price is not being raised more than is absolutely necessary, and that it will be reduced at the earliest possible moment.

Steam Raising Problems.—On Monday evening, March 30, Mr. A. Whatmore, A.M.I.M.E. (Works Manager of Messrs. Parkinson and W. & B. Cowan, Ltd., Victory Works, Manchester), gave a lecture before the North-Western Section of the Junior Institution of Engineers, on "Steam Raising Problems." He discussed various forms of firing, including gas firing, and mentioned, in making a forecast of the future, that the day would come when there would be super-gas stations, in a similar manner to the super-electricity stations now being built. This would allow of all coal being gasified, the bye-products sold, and gas supplied to manufacturers for steam raising, and also the supplying of gas to super-power stations either for firing the boilers to produce the steam for turbines or for gas engines. This would result in considerable economy in regard to production, and also eliminate to a certain extent the smoke problem. A good discussion followed the lecture.

The Directors of the Abergele and District Gas Company have decided to reduce the price of gas at an early date by 7d. per 1000 c.ft.

To bring home to local allotment holders and others the use of sulphate of ammonia as a fertilizer, the Burnley Gas Department are making a demonstration in their showroom. The display is arousing much interest.

Alderman Aspinall, speaking on the occasion of "budget day" in the Bolton Town Council, said it was gratifying to note that the gas undertaking was likely to finish the financial year considerably better than was anticipated twelve months ago.

At a meeting of the Blackpool Town Council, on April 1, Alderman Broadhead said they had £10,872 to the credit of reserve on the gas undertaking. This he regarded as insufficient, and for this reason it was proposed to place the whole of last year's profits, and unappropriated balance for the previous year, to the improvement of this reserve. He said that there had been considerable development in the gas undertaking; the consumers having increased from 21,280 to 22,606—equivalent to 6 p.ct.

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GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

(Founded in 1849 as the "Journal of Gas Lighting.")

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EDITORIAL NOTES.

Education Scheme Difficulties and Their Treatment.

No innovation such as the Education Scheme for staff members or those training for official appointments in the gas industry can be introduced without some difficulties arising which have to be negotiated. Some time ago we referred to what has been done to correct the original scheme in respect of deficiencies in meeting circumstances which experience had brought to light. The scheme as revised, and as approved by the Council of the Institution of Gas Engineers, the appropriate Government Departments of Great Britain and Ireland, and the City and Guilds of London Institute, has now been incorporated in a pamphlet; and in the current state of conditions, it is, we think, about as perfect as it can be made. The means adopted for overcoming such a difficulty as the want of educational facilities for applying the scheme as originally framed, it is hoped, will prove to be more or less temporary; but meantime we have to get the maximum benefit from the scheme in the ways that are most available. Those who have had this work in hand recognize that it would be most unfair to aspirants for examination and certification honours who, by reason of the disabilities placed upon them by geographical situation and far removal from educational centres where work complying with the scheme is in operation, might be denied facilities for gratifying their legitimate ambition. That there are many such young men in the industry is a matter for congratulation, as it shows the existence of the right spirit, and an appreciation by them of the value of the knowledge and certification for which the scheme provides.

It appears, however, that there are many in the industry, particularly among the juniors, who, after all the explanation that has been given, find it troublesome to understand the details of the scheme, and their own place in it. In view of this, a simple summary has been prepared by Mr. Walter Hole, the Organizing Secretary, in which he has stripped the subject of all technicalities, and has put in plain language an outline of the scheme to serve as a guide to students who have not properly grasped its structural features and intentions. It will be seen from the article (published in later columns) that the scheme now caters for all grades of workers in the industry, from the craftsman up to the man who hopes to gain professional status. The first division deals with the training of gas-fitters; and this has been arranged in conjunction with the City and Guilds of London Institute. We want our gas-fitters to know not only the technics of gas-fitting and the utilization of gas, but also the elements of the sciences upon which those technics are based. Those who go through the course provided and prove in the end that they have absorbed the instruction they have received are the type of men the gas industry needs to-day; and they will be greatly sought after for responsible positions in the important work to be done on the district. Efficiency in gas-fitters means much to the consumers of gas and to the supply undertakings. Then there are those staff men who are engaged in the intermediary work of a gas undertaking—that is the work lying between that of the professional men and the craftsmen. No one who earns his living in the gas industry should be without knowledge of its processes and transactions, so as to be able to talk intelligently on them. There is a regular army of these men in the industry; but a very large proportion are ineffectives so far as the interests of the industry are concerned, other perhaps than in the routine clerical or other work upon which they are engaged from day to day. The inclusion of these in the scheme is a recognition of a latent value to which activity should be given. An increased intimacy with gas-works and gas-supply practices will be an intellectual advantage to them, will safeguard them against a display of ignorance and the pitfalls which surround those without exact knowledge; and, as men employed by a gas undertaking are expected by laymen to be in the position to give them information as to gas applications, their ability to do so will be an advantage to the undertaking. Such men will see from Mr. Hole's article what is provided for them, and how they may proceed. Even those who are isolated geographically, and so cannot attend classes, will find an open door.

Then full information is given in the article as to the professional courses in engineering and gas supply, each of which is divided into three grades—the Ordinary, the Higher, and the Diploma. A list is given of technical institutes where the courses can be taken, and from the Principals of which information can be procured. The list accentuates the fact that there are considerable areas in the country in which there is no proper provision for taking the courses. But these cases have been legislated for in the second part of the scheme, but in a manner which it is hoped will not be permanent in all cases. The necessary information regarding procedure in this connection is given by Mr. Hole towards the end of the article, which he concludes by dealing with the crown of the whole scheme—the Diploma.

A good piece of work has been done in meeting those conditions which opposed—in some respects it is believed only temporarily—the universal application of the scheme; and, after the explanations given elsewhere, the way to achievement should be found much easier by all students and intending candidates for those attestations of competence which will become important aids to securing preferment in the work of the industry.

The Gas Engineer in New Zealand.

THAT the man who undertakes the chief executive and advisory responsibility of a gas-works in New Zealand must be a veritable tower of strength and highly efficient is disclosed by the Presidential Address of Mr. James Lowe, M.Inst.C.E., the Manager and Engineer of the Auckland Gas Company, Ltd., to the Gas Institute of the Dominion. This is a new organization; and there can be no gainsaying that conference between the men of the gas profession in New Zealand is as essential as—perhaps more so than—it is at home or in other countries where organizations have long been established. If, in passing, we regard our conditions at home as the standard for comparison, then we find that, through their geographical situation, the conditions under which gas men in New Zealand have to work and meet difficulties go far beyond it. In contrast, circumstances at home—though we do not consider them light in comparison with the past—are easy;

and we know full well that the more conditions worsen difficulties, the greater the need for courage and technical ability to meet them. Mr. Lowe himself obtained much of his primary professional experience in a school where the gas man had to become thorough, and where he became hardened to difficulties, and met them full face. It was in the early days of this century when we were walking with Mr. Lowe in the gas-works at Glasgow. Thence he went to take the responsibility of the engineership and management at Auckland. He knows the value of professional conference and comradeship; and we wish the new Gas Institute of New Zealand a life of good and helpful work in the interests of the members and of the undertakings they serve.

The word picture which we published last week from the Presidential Address as to the conditions under which the gas industry is carried on in the Dominion, we are confident has given to gas engineers at home interest in their compeers working in the circumstances depicted; and today we reproduce a descriptive account from the same source of the works of the Auckland Company. Though these contain some special features in plant and process which will arrest the attention of gas engineers, we will here confine ourselves to a few comments upon the general conditions which confront the gas engineers of New Zealand, and which they meet with verve and success. It is obvious that there the engineer and manager has to be more self-reliant than the engineer at home. Here there are firms of spacious experience who specialize in various types of plant. Their experience is of inestimable value to the gas engineer, who, however, must have selective capabilities for his particular circumstances and the ability to discriminate and decide wisely on the representations and offers of competing firms. In New Zealand the engineer has to prepare his own plans, and frequently look after the fabrication and, almost invariably, the erection of his own plant. We pride ourselves nowadays in the workshops possessed by our larger gas-works. Mr. Lowe has had the opportunity, through a recent visit home, to make comparison of what is provided here in this respect with what, in the isolated circumstances of New Zealand, has to be furnished there. In consequence of the character of the work that has to be performed, through not being in the position to depend upon contractors for new structure and repairs, he tells us that the workshops on the gas-works in the Dominion have to be equipped with appliances and tools on a scale exceeding that to be found in similar sized works in Britain. One result of the war has been to increase self-reliance by engaging locally in the manufacture of certain forms of gas plant. That is a natural evolution in a distant country such as New Zealand with engineers strong in initiative and execution, and equal to meeting the needs—not only in days, but in years of emergency. There is another incentive to the people of the Dominion to be pioneers to the utmost in providing for their own needs, and that is capital costs, which are, through freightage, insurance, wharfage, &c., some 40 to 50 p.ct. more than at home. This is a further good reason for the exercise of engineering faculties with the view to lower initial costs, so long as efficiency is not assailed.

Again in the distribution department, conditions are not the same as here, though in one respect in this country we are getting a taste, through housing schemes and the construction of fewer houses on a given area of land, of what is a very common condition in New Zealand, save in certain of the principal streets. Mr. Lowe mentions that, owing to the practice of building houses of the detached type on sites usually not less than a quarter of an acre to each house, the density of population is less than in cities and towns at home. This, of course, contributes to higher capital and other costs for distribution, through less services being connected per mile of main with consequent smaller gas consumption per mile, though, naturally, from the health point of view, the open-space system of building has much to commend it. Then the chief meal of the day for all classes is taken in the evening; and therefore in the winter one has the peaks of the lighting, heating, and cookery loads all combining, between five and six o'clock, to make a peak of a formidable order. This also assists to swell the capital expenditure on mains per 1000 c.ft. of gas sold. But by superimposing a high-pressure system on the low-pressure network, considerable economies can be effected in the cost of mains in a growing district.

Considering these matters (and they do not sum up the conditions which, in comparison with this country, are adverse influences), there is no reason to be surprised that gas prices are higher in the Dominion than in Britain. Comparatively, we at home are in a highly favoured position in regard to coal. Unfortunately the most available coals in New Zealand are unsuitable for gas manufacture, owing to sulphur and non-coking characteristics. The result is that Auckland, in common with other gas undertakings, draws coal supplies from the Maitland coal-field of New South Wales, and from the West Coast mines of the South Island of New Zealand. Last year the cost of the coal was £2 2s. 9d., or £1 0s. 5d. more than in 1913; but the price of gas has not risen in the same proportion—being 7s. 6d. per 1000 c.ft., as against 4s. 3d. In this country we think we are badly treated by having to pay an income-tax of 4s. 6d., but in New Zealand it is 5s. 10d., and alone it represents 6·02d. per 1000 c.ft. of gas sold. The narrative of differences which are adverse to gas supply in the Dominion proceeds into unfair competition with Government subsidized electric schemes, towards the provision of money for which the gas undertakings and consumers have unfairly to subscribe as taxpayers. What happens is that the former have to compete with Power Boards supplied with electricity from State hydro-electric works, on which the Government are spending large sums; and are subsidizing them in various ways. The Power Boards do not pay income-tax or local rates, and deficits are made good from the general revenue of the State. We hope things will never go to that length in this country, but we are threatened with the application of part of the same policy. However, in New Zealand Power Boards also receive indirect subsidies through their plant coming in duty free, while gas and steam engines for other people are charged 10 p.ct. duty, and cast-iron pipes above 9-in. diameter and steel pipes above 6-in. diameter pay 20 p.ct. duty. In fairness Mr. Lowe mentions that machinery for any manufacturing purpose is now admitted free of duty, provided it can be shown to the satisfaction of the Minister of Customs that it could not have been economically manufactured in New Zealand. To cap all this, the Dominion possesses the most advanced labour legislation in the world. Agreements can only be made for three years, but invariably the term is two years. Thus labour ebullitions are constantly occurring; and consequently peaceful times for the gas manager are few and of short duration.

While after this gas engineers at home may think a little less hardly of their conditions, they will sympathize freely with their colleagues in New Zealand. It is curious that the Government there should employ their legislative power to pack upon the industrial burdens inseparable from geographical situation, other burdens which are neither just nor contributive to the best public service and interests.

Healthy Buxton.

Those scientists who delight in the measurement of the foreign particles which pollute and densify our atmosphere, and which are so luxuriantly contributed to it by the combustion of raw coal for domestic and industrial purposes in our cities and towns, have on occasion referred to the excellent condition in this respect of the air of Buxton, as compared with that of large industrial centres. But this tribute to the relative purity of the air of the town does not altogether satisfy the Mayor (Alderman C. W. Buckley), whose scientific attainments are well known in the medical world. He can write after his name M.D.(Lond.), and M.R.C.P.; and he is a distinguished consultant on rheumatism, gout, and allied diseases. He is also a University lecturer on balneology, of which subject he is a world-renowned authority. In addition, he is Director of the Biological and Bacteriological Research Laboratories of the Devonshire Hospital, of which he is also honorary physician. We mention these high qualifications to show that his opinions on domestic heating are not without the basis of good authority.

The Buxton Corporation Gas Undertaking (as a report in other columns shows) recently inaugurated new Gas Service Buildings—the title alone discloses their functions,

and attests the existence of a progressive administration. On the occasion, Dr. Buckley spoke of the utilization of gas as a heating agent. He acknowledged how considerably it has developed as a source of heat to the greatest possible benefit of the country, and yet his subsequent remarks indicate how large is the amount of work yet to be done in transferring domestic heating from the smoke-producing methods of our forefathers to the more scientific, cleanly, and labour-saving methods of modern times which have been promoted so extensively by the gas industry. Dr. Buckley is emphatic as to the value of gas as a heating agent. One of his remarks was that he is disposed to say there is no more efficient means of heating than by gas in the present day. It possesses great advantages over coal; and he sees in it the means of helping very largely in the solution of the smoke problem. While admitting that the smoke problem in Buxton is not a serious one, he regards it as quite serious enough; and he asked the people of Buxton to do all they can to eliminate smoke from the atmosphere of the town by using gas for both domestic heating and cooking. He would not have done this did he not believe in the virtues of gas heating. He also accentuated the facts that smoke in the atmosphere does much to prevent people enjoying the full health-giving benefits of sunlight, and that it means a serious waste of the valuable properties of coal. In his opinion, too, the gas fire possesses every advantage which can be claimed by the coal fire; it is not unhealthy, and does not contribute to the deterioration of the atmosphere.

One of Dr. Buckley's remarks suggests a comparison. He was referring to the value that is derived from the carbonizing of coal at the gas-works—mentioning among other points that 10 tons of coal will produce 130,000 c.ft. of gas, in addition to coke, tar, sulphate of ammonia, and the derivatives of tar. The gas supplied in Buxton, we believe, has a calorific value of 510 B.Th.U. per c.ft., so that the 130,000 c.ft. produced from the 10 tons of coal would give a potential thermal value of 66,300,000 B.Th.U. Used in gas-fires, of this quantity some 75 p.ct. would be given to the rooms as useful heat, or 49,725,000 B.Th.U. Some people have the idea that on the basis of heat rendered there is a considerable difference between coal and gas in favour of the former. This notion the gas industry must combat, seeing that the difference resides more in imagination than in actual fact. For instance, assuming the 10 tons of coal were used in domestic fire-grates for room heating, only about 20 p.ct. of the potential heat value of the coal would be given as useful heat; the remainder passing away up the chimney. If the coal has a potential thermal value of 29,000,000 B.Th.U. per ton, the value of the 10 tons would be 290,000,000 B.Th.U.; and 20 p.ct. of this would be 58,000,000 B.Th.U., as against the 49,725,000 B.Th.U. which would be given by the combustion of the gas for the same purpose. Thus we see how narrow becomes the difference; and, from the economy point of view, it is reduced still further by the fact that gas-fires can be lighted and extinguished as needed, while in the case of the coal fire waste of fuel is inevitable through the maintenance of the fire in the time between the stages of actual requirement. Further compensation is given by the labour-saving and convenience of a means of heating which can be used at will; and, moreover, a means which cannot be charged with assisting to produce the miasmic conditions of the atmosphere of which so much complaint is made on account of the injury to health and property. Such testimony as Dr. Buckley gave at the opening of the new Gas Service Buildings for Buxton is invaluable.

The hope of the Mayor that the people of Buxton will turn still more extensively to a fuel supplied to them through pipes and always on tap is likely to be fulfilled, and at a brisker rate than ever before. The new Gas Service Buildings are a means to that end. It is one of the most advanced provisions that has been made for increasing efficiency in the district work of the undertaking; and the district work is the very genesis of gas development. We congratulate the Chairman (Alderman A. W. Wall) and members of the Gas Committee upon their enterprise, and the Engineer and Manager (Mr. F. G. Shaw), whose work for the concern has won for him the complete regard of the Council and of the ratepayers. Another matter for hearty felicitation is the financial condition of the concern. It shows administrative wisdom; and, in these times of high costs, it will be of considerable advantage to the town through the contribution the gas undertaking will make to public service, which should be the predominant feature and aim of any productive concern municipally controlled, and not the making of profits to aid the rates. Many a local authority gas concern may well envy the Buxton undertaking its low balance of unliquidated capital. The capital of £90,000 has been wiped-out with the exception of £7000, and this could have disappeared had not £18,000 been contributed since 1911 to the relief of the rates, and a subscription of £2000 made to the cost of erecting the Town Hall. The expenditure on the new Service Buildings—some £3000—has also been defrayed out of revenue. Happy should be all associated with the Buxton Gas Undertaking.

British Empire Gas Exhibit.

At 10 a.m. on Saturday, May 9, the gates of the British Empire Exhibition will be re-opened to the public. The ceremony is due to begin at 11 a.m.; and the programme is now awaiting the approval of the King. Semi-state, it is expected, will be the order of the day. The arrangements for the Gas Industry's Exhibit are proceeding splendidly. An entirely new show has been devised; and additional adjoining space has been taken. A special feature of the exhibit will be a display, with an Imperial keynote, showing that gas is already freely used, and is fast making headway, for industrial no less than for domestic purposes, not only in Great Britain but throughout the go-ahead Dominions and Colonies. Important industrial uses of gas and coke will be demonstrated on a comprehensive scale, while in the large and artistic Rest Lounge the solution of the housewife's troubles by the use of gas on modern labour-saving lines will be the main attraction. In addition, part of the new space taken will be turned into a hall where demonstrations on the cookery of Empire foods, preceded by short lectures, will be given several times a day.

Coke Competition.

Candidates are reminded that June 30 is the latest date for receiving papers. Full details were published in the "Journal" for Feb. 18. Any additional information required can, by specifically stating its nature, be obtained from the Editor of the "Journal." The prizes range from £200 down to £10—the total sum for distribution (through the kindness of the Woodall-Duckham Company) being £1000. The honour of being the author of a winning paper will also count for much.

Cost of Free Maintenance.

In last week's issue, editorial comment was made upon the statement of Mr. J. W. M'Lusky at the North British Association meeting, as to the cost of free inspection, adjustment, and maintenance of consumers' fittings, less outlay for materials. The figure works out to 0·592d. per 1000 c.ft. sold. From the report of the discussion on the papers by Messrs. Napier and Keillor, and the statement of Mr. M'Lusky (published last week), it is seen that smaller towns are finding that the cost is in close proximity to that of Glasgow. Mr. R. Sturrock, of Ardrossan, states that eighteen months' experience there shows that the cost works out to 0·52d.; and Mr. J. J. Scott, of Cowdenbeath, says in his case—a mining district—the cost does not exceed ¾d. per 1000 c.ft. Mr. M'Lusky also supplied, in replying to the discussion, some further information as to the staff employed on the work, which gives additional value to the particulars as to houses and appliances which appeared in the "Journal" last week.

Blow Gases for Retort Heating.

Mr. James Lowe, the Engineer and Manager of the Auckland (N.Z.) Gas Company, as our readers are well aware, has taken a great interest in the development of water-gas plants. At his works, there are three such plants in continuous use—two of them being installed in conjunction with the horizontal retort-house, and one for the vertical retort installation. An interesting feature is that the blow gases are utilized for heating

the coal-gas retorts. In the case of the plants used with the horizontal settings, the water gas, after being partially cooled, is passed directly into the foul main; but in the third case the hot water gas is passed through the coal charges in the vertical retorts. Thus in both gas processes a higher thermal efficiency is promoted.

Price Increases.

"Meteor" of the "Electrical Times" is cynical regarding the increases of the price of gas which are taking place, owing to the state of the secondary products markets. While this condition obtains in the gas industry, he says reductions in the price of electrical energy are being announced all over the country. Not long since, the electrical papers were crying out against the maintenance of charges for electrical energy which they considered were delaying the arrival of universal domestic electrification. However, "Meteor" says: "It should not matter very much to the gas people that their commodity is growing dearer whilst ours is becoming cheaper; for Mr. Goodenough has recently demonstrated that there is such an enormous gulf between one pennyworth of gas and one pennyworth of electricity that we can only look forward to a continuation of our miserable existence." Mr. Goodenough said nothing about a "miserable existence." What he remarked about the gulf between a pennyworth of gas and a pennyworth of electricity for heating purposes is not altered by the cheap sneers of "Meteor."

Wages Subsidy and Employment.

Various investigations are being made in connection with the proposals that a wages subsidy should be provided in the case of the more important industries to bring about an increase in the amount of available employment. In addition to the Government Committee, who are exploring the whole question of subsidies, and a Sub-Committee appointed by the Executive of the Parliamentary Labour-Socialist party, the Federation of British Industries are also moving in the matter. They have appointed an exceptionally strong Committee to inquire into the proposals for alternative methods of relieving unemployment by devoting moneys at present expended on the dole to the purpose of subsidizing industry and thereby enabling crease in the amount of available employment. In addition to pointment of the Committee, however, is not to be taken as an indication that the Federation endorse the proposal. Indeed, the matter is one of such extreme complexity, and raises issues of such importance, that it is impossible for industry to express any views either one way or the other until the question has been subjected to expert examination, and research made into every aspect. As an outcome of the Committee's labours, the Federation may be in a position to submit recommendations to the Government, always assuming that, after full investigation, industrial opinion is favourable to the scheme.

The Coal Inquiry.

It is difficult to say whether or not any good is likely to come out of the joint inquiry by the representatives of the coal-owners and the Miners' Federation into the conditions of the mining industry with the view of ascertaining what remedies shall be applied. Those upon whose word there could be reliance are not divulging anything; but Mr. A. J. Cook, the Secretary of the Miners' Federation, appears to find it impossible to keep his tongue from wagging, and referring in depreciatory terms to what the Joint Committee are doing. In his opinion the efforts of the Committee represent so much time wasted. He also states that the owners have been pressed for suggestions for improvement, but they have not put any forward. Mr. Cook seems entirely to misunderstand the objects of the exploration that is being made, although he is a member of the Committee. The first thing for the Committee to do is to ascertain and investigate the causes of the present conditions of the industry, and then, when they have done that, to suggest, jointly if possible, the remedies which in their wisdom they consider should be applied. At the same time, Mr. Cook declares that the men are not going to work longer hours, and intend to have a living wage. But if he would sit down quietly for a little time and consider where the money is to come from for an advance of wages for the work performed, he would show a prudence which has been absent from his wild talk—at any rate during the past two or three months. Perhaps if the Joint Committee persevere, they may come to a conclusion which will show how more money can be made, and at the same time increase the demand for British coal in face of foreign competition. Maybe it will be found that the only way of enlarging the revenue from coal is the very one which the Federation and Mr. Cook say they will not tolerate. If it is the only way, and the miners will not apply it, then there is nothing more to be done, but to let things drift on as they are doing now, and so become worse. But Mr. Cook has another plan—the plan of force, which would not provide, but would waste, money. He tells all whom it may concern that the Miners' Federation are going ahead with their arrangements for an alliance with other unions to meet "eventualities." The eventuality he has in mind is no doubt the securing for the miners money which does not exist. Another point is that, although the inquiry is proceeding into the economic conditions of the industry, the various districts are now considering the framing of a new wage programme which is to be discussed at the next delegate conference, when the question of amending or giving notice to end the present wage agreement is to be decided—from the point of view of the miners.

PERSONAL.

Mr. Frank Harding Jones, M.Inst.C.E., who has for many years been a Director of the Wandsworth, Wimbledon, and Epsom District Gas Company, has been elected Chairman of the Company, in succession to his father, the late Mr. H. E. Jones. In making the announcement, the "Wandgas Magazine" adds that "his election secures unbroken the continuity of great and generous services of the Jones family to the Company."

Mr. E. L. Farquhar, of Lower Largo, has resigned the position of Hon. Secretary and Treasurer of the Eastern District of the Scottish Junior Gas Association, and will be succeeded by Mr. John Scobie, of Dunfermline.

The new President of the Chichester Rotary Club is Mr. T. N. Ritson, the Engineer and Manager to the City of Chichester Gas Company. Mr. Ritson, who has taken a great interest in the Rotary movement since the Club was started in 1919, has addressed the members on "Gas and the Bye-Products in relation to the War," and "The Origin and History of Coal;" and he was to have lectured on "Water Supply" last month, but was unfortunately indisposed, so that this had to be postponed.

On the occasion of his marriage, which took place on the 9th inst., Mr. Lawrence Farquhar, Gas Manager at Peebles, was presented by the members of the Town Council and burgh officials with a sum of money with which to purchase a tea service. Provost Davidson, who made the presentation at a meeting of the Gas Commissioners, said Mr. Farquhar had endeared himself to them all by his amiable and quiet ways, and they asked his acceptance of the gift as an expression of their regard.

OBITUARY.

We regret to report the death of Mr. William Bryant, of "Cardynham," Truro. The deceased, whose wife had died only a few weeks previously, had been Chairman of the Padstow Gas Company, Ltd., since its formation, and was a Director of several other gas undertakings in Cornwall, including the Camborne Gas Company. He was a well-known figure in the district, and great sympathy will be felt with his relatives.

Mr. J. Readshaw, who for fifteen years has been one of the London Representatives for the Volker Lighting Corporation, and for Lighting Trades, Ltd., since its formation, died on the 11th inst., at his home at Colliers Wood. The funeral took place on Saturday last in West Norwood Cemetery.

Institution of Lighting Engineers.—In the matter of the payment by local authorities of the expenses of delegates in attending the annual meeting and conference of the Institution in Leeds next September, the Hon. Secretary (Mr. W. J. Liberty) has been officially informed that the Minister of Health "would be prepared to consider applications from local authorities whose accounts are subject to Government audit for sanction to the payment of the expenses of attendance at the meeting and conference of not more than two delegates, one of whom should be the engineer or superintendent for public lighting in the district."

ELECTRICITY SUPPLY MEMORANDA.

Illuminations at Wembley.

Last year there were two sets of opinions regarding the lighting of the British Empire Exhibition grounds. Those who harbour the idea that everything electrical must be good, and who so deceive themselves, considered that the electric lighting was exquisite, and poked fun at the gas lighting in the Amusements Park. But the major electrical opinion was that the gas lighting was excellent, and that electricity had lost one of the finest opportunities it had ever been given to display its capabilities in subscribing to public entertainment by lighting effects. This year in the main parts of the grounds, an attempt is going to be made to do much better in effective illumination. The "Illuminating Engineer" informs its readers that Messrs. Sparks & Partners, the Consulting Engineers, invited the Electric Lamp Manufacturers' Association to put forward proposals; and their Lighting Service Bureau submitted a scheme which has been accepted. But so far as we can gather, there is nothing very original in what is to be done, excepting in respect of a zoological, piscatorial, and horticultural collection of models with (apparently) coloured lamps in their vacuous insides. Some of the principal buildings, entrances, and garden beds will be outlined with electric lamps of selected colours. In the north gardens and at the south-west entrance will be installed two illuminated columns of neon tubes, some 40 ft. high, having the appearance of columns of fire. In "Kingsway," our contemporary says, sixty tall standards are being erected, each fitted with twenty yellow-sprayed 100-watt gasfilled lamps. To provide contrast, and to throw into relief the colonnades of the Palaces of Engineering and Industry, flood-light projectors of a special type will be concealed behind the columns. The lower projectors will be fitted with light blue screens and 1000-watt lamps; the light being thrown upwards. The upper projectors will serve for the downward projection of light of a rose-pink colour. On the roofs steam-jets illuminated by a flood-light projector and colour-screen will resemble dancing coloured flames. The buildings will be outlined with 20-watt yellow-sprayed lamps on 18-in. centres; the panels being treated with green lamps, and the bases of flag-poles with red. There will be the illuminated swans, ducks, Noah's Arks, water lilies, and grotesque fish floating in the lake. Near Digger's Bridge a family of illuminated penguins is being installed; on the lawns and on the southern side of the lake, illuminated frogs, snails, tortoises, rabbits, and hares will be seen. Some of the trees will be alive with flocks of brilliantly lighted and gaily coloured parrots and owls. We are glad they will be of the dumb kind. One spreading oak will be the centre of a miniature "Garden of Eden," and will bear large luminous apples; and entwined round the trunk will be a forbidding serpent studded with green lamps. Oak trees are not supposed to bear the kind of apples of scriptural fame. The trees on the tea or dancing island will be fitted with large oranges and lemons containing 60-watt lamps. The frontage of the Stadium will be flooded with amber light from concealed projectors, and the colonnades will be thrown into relief by concealed lighting of a contrasting colour. On the roof will be a mammoth fan of coloured searchlight beams. We shall be interested to see how it all works out.

Scientific Two-Part Tariffs.

The search for a suitable tariff for the electricity supply industry promises to be an eternal one. The men of the industry have been largely concentrating for some years past on a two-part tariff, but hitherto they have not succeeded in finding one which could glory in the fact that it is founded upon the electrical requirements of the consumers and the electrical costs of meeting their demands. Basing the fixed charge upon rateable value, floor area, or the dimensions of the buttons of the waistcoat of the householder, has no justification, and inflicts upon different individuals divergent treatment which cannot be in any way vindicated. These considerations are well known to the men of the electrical industry; and, to the credit of some of them be it said, they are endeavouring to find means to construct a bi-part tariff which shall have scientific authority. So far, there has not been success. As a matter of fact, the farther they go with their proposals, the more complex the conditions become, and the less explicable to the consumers. It appears that the only possible method to adopt will be to base in some way the fixed charge upon electrical requirements, without taking into consideration the whole of the embroidery which some of the investigators would like to apply to them. These remarks are suggested by perusing two papers which were recently read at a meeting of the Institution of Electrical Engineers. One of them was by Mr. H. M. Savers; and in this he discussed the influences of load factor, diversity factor, and distribution costs and losses upon the construction of a tariff. The other paper was jointly by Mr. G. Wilkinson and Mr. R. M'Court, in which they sought, by "simplification and discrimination," to frame a system which in their opinion could be applied. But the so-called simplification and discrimination there can be no question would lead to still greater confusion in the minds of consumers, and might possibly be obstructive to the greater use of electrical energy which they desire to promote.

Distribution Influences.

The contribution by Mr. Sayers is of extreme interest, as it shows how largely distribution costs should affect the charges to the consumers in particular localities. The author submits that a practical tariff should be based upon costs. This, of course, is a matter of comparative simplicity when applied to factories, traction, and bulk supplies; the only consideration in the upper direction being the cost at which large consumers can generate for themselves, with (say) gas-driven plant. The real difficulty is the case of the domestic consumer. In the domestic business, individual costs of services, meters, and working expenses are relatively high, and dissimilar as between one consumer and another; this being partly due to the differences of their load characteristics. Lighting is at the present time the main demand in electrical domestic service, and the load factor is of the order of 10 to 12 p.ct. If the load factor could be raised from 10 to 30 p.ct., Mr. Sayers says this would reduce the cost of the units sold by at least one-third all round, and probably more. While the influence of load factor on generating costs has been extensively studied, the effect on distributing costs has not been scrutinized so closely. This is no doubt due to the complexity of the subject, and to a disinclination to enter into it in detail. It is pointed out that distribution costs per unit sold are often two to four times the cost of generation. Thus the scope for research into distribution costs is large. An interesting point is made by Mr. Sayers when he says that the diversity factor only improves the load factor on the distribution side if the diverse loads are supplied through the same mains; but the cost of distribution through any one feeder with a 10 p.ct. load factor is not in the least reduced by the existence of other sections enjoying a 50 p.ct. load factor. This is a point which is not always kept in view by electrical men when they are considering somewhat expensive extensions of their distribution systems into rural areas, where the load factor is not likely to be good or the diversity factor of much consequence. In several ways, the author shows that the relations between cost per unit sold, load factor, and form factor, are not alike for generation and distribution; the latter being more complex and more affected by load characteristics. Another useful point to remember is that generation costs when based on "per unit sold" include distribution losses; but, on the other hand, the cost per unit sold, in view of the fact that it includes these losses, is not fair to the station in determining its economy *per se* and the efficiency of its running. In order that means may be taken to reduce distribution costs, one must, of course, obtain information as to their magnitude. This is obvious when one remembers that there are systems where the units sold only reach some 55 to 60 p.ct. of the total sent out.

The Tariff Suggested.

The costs of the units sold through any distributor in a year are: (*a*) The cost of the total number of units delivered to the distributor, including all capital charges and the cost of the losses up to the feeding-point. (*b*) The capital charges to the distributor. (*c*) The capital charges on the services, meters, &c., and the cost of meter-reading, &c., for all consumers. With reference to item "*c*," this should be charged to the individual consumers as a meter-rental, or a charge per KW. of connected load. The total of "*a*" and "*b*" divided by the total units sold gives a sum per unit which, with a reasonable addition for profit, is a proper average price for all the consumers. The method which the author suggests for arriving at tariffs for domestic supply is to classify consumers by their load and diversity factors—that is, by observation of selected groups with similar proportions of connected load for different uses. He holds that tariffs recognizing the load and diversity factors of domestic consumers by classes are practicable, and will attract the most desirable domestic load—thus improving the utilization of distribution systems and bringing about progressively a reduction in the charges to consumers.

A Second Scheme, and a Fine for Excess.

Turning now to the contribution of Messrs. Wilkinson and M'Court, they agree that a two-part tariff is the best for encouraging the greater use of electricity; but they contend that the charge should be based on the electrical requirement of the consumer in watts or kilowatts. Their idea is that the requirements should be classified on a basis upon which the consumer would pay 8d. per KW.H. for a minimum number of units, and a low price per KW.H. for the residue up to a declared maximum. For any excess the user would be fined by charging him at 6d. per unit. Thus we have once more proposed simplification running into complexity. From this state of things our electrical friends seem to find it impossible to escape. It is suggested that for such a tariff a cheap and reliable mechanism is required, which, while limiting the consumer to his declared maximum supply, will also secure a higher rate of tariff during the time when he exceeds, by accident or design, his declared maximum demand. This, we

take it, would mean additional initial costs in fitting out the consumers. The authors believe they have devised a suitable device for the purpose. They use a two-rate meter, on one of the dials of which all current used under normal conditions, including the number of units at 8d. per KW.H., is recorded. After this, the low price per unit comes into operation. Then, if the consumer exceeds his pre-arranged demand, a "discriminator" comes into action, and automatically transfers the record of current consumed to a second dial—the units registered by this being charged at (say) the 6d. rate. We are not surprised that in the discussion there was a good deal of criticism of this proposal. One of the speakers suggested that what was called for was a means not of preventing excess units being consumed, but of preventing their being used when the system is fully loaded. It would, however, be an insuperable difficulty to obtain a mechanism which would discriminate in the case of individual consumers, when using excess units, as to whether or not the system was fully loaded. From the various speakers, the authors did not get much encouragement, though their efforts to design a two-part tariff with scientific authority were looked upon as a good contribution to a vexed question.

"Safety" Items. The electrical papers a time ago hammered at the question of the removal of gas from the service of lighting trains, on the ground that the fires following accidents were due to its presence. Fires were, of course, experienced in train disasters in the days of the old oil-lamp. Our friends were also heedless of the fact that, if a cylinder is fractured containing gas under pressure, the gas does not linger about for the purpose of providing the electrical journals with a point against the rival. The "Lest We Forget" articles of our dear old contemporary the "Electrical Review" are well in memory. We are not going to imitate it, by now pleading that it is time electricity was abolished for use by or on trains because of the fearful results of a collision between two electric trains in the suburb of Las Planas, near Barcelona. Though gas was not used on those trains, the carriages of one caught fire after leaving the rails. What has the "Review" to say to that? The train which left the rails carried about 180 passengers; and the messages from Barcelona state that something like thirty lost their lives, and approximately 105 were injured—fifty, it is feared, fatally. Many of the bodies were terribly mutilated, some were crushed beyond recognition, and others were burned when the train caught fire. We will not ponder over the ghastly details. Will the "Review" in the circumstances? Returning home, we see that the evening services at the Burton-on-Trent churches were brought to an abrupt conclusion on Easter Sunday, owing to a breakdown at the Corporation electricity works. Not only the churches, but other people who had put their faith in the fickle illuminant suffered the penalty of untimely inconvenience. Last Friday week at the Wellington Mills at Port Dundas, Glasgow, there was an explosion of some highly inflammable vapour employed in the waterproofing process carried on at the works. One young woman was killed, and two others were seriously injured. It is conjectured that the ignition of the vapour was caused by a spark from a machine, or by the fusing of an electric light wire. The reporter who made this statement ought to be handed over to be dealt with by the electrical editors in London. There is nothing that makes them so cross and sets them capering so much as the suggestion that electricity is guilty of such conduct.

Water Power and Electricity. During and since the World Power Conference, we have heard a great deal about the cheapness of electricity in countries possessing large water powers; and interesting tales have been told as to the considerable and varied use that is made of the low-priced current. The communities are fortunate in the possession of water power so long as it behaves itself, in view of the fact that countries like Norway, Sweden, and Switzerland are largely dependent upon imported coal. But, as we pointed out some time since, those countries with their water-power generated electricity have their difficulties, and occasions when supply cannot possibly satisfy the demand. There come periods of drought when there is incapacity to meet the large loads put upon the plant at times of luxuriant provision by Nature of water power. We find from a report published in London as recently as April 6 that in Switzerland, in certain districts and in many towns, electricity is still being rationed owing to the continuation of drought all over the country. It is a pity we cannot transfer some of our superfluous rainy weather to the drought-oppressed people of Switzerland. For some six months they have had a drought; and it is causing all sorts of difficulties through the country—among them being this one of the provision of electricity. The only means for avoiding insufficiency of water power during periods of drought for the supply of electricity is to provide large steam-raising plants as standbys to the water power; and the larger the use made of the water-power generated current, the greater must be the aggregate of the steam-raising units. This means a considerable expenditure of capital, which must be a charge at all times upon the consumers of the water-power generated electricity.

LOW-TEMPERATURE DISTILLATION.*

"Low-Temperature Distillation," by Sydney H. North (late Editor-in-Chief, "Oil Engineering and Finance") and J. B. Garbe (late Assistant Professor at the University of Louvain), is, above all, well written. When the authors deal with what may be termed the "straight" technical matter, they are sound enough; but when they beat the big drum of low-temperature carbonization—and this is done at intervals far too frequent throughout the book—they are too sweeping in their conclusions, and too apt to be carried away by their own viewpoint. No thinking man will deny the desirability of obtaining a home-produced oil supply; and if this can be done by distilling what is now regarded as waste fuel, a great industrial need will be filled. But when the authors go on to say glibly that, "for ordinary industrial fuel . . . and for domestic purposes of every form, the future lies in passing all the bituminous coal through low-temperature carbonization, extracting the maximum of oil possible of the highest quality, and forming ultimately a synthetic coal, smokeless and adapted in composition and form to the purpose for which it is destined," the man with a broad scientific outlook will not be greatly impressed by this dogmatic statement and many other similar ones; nor will he agree that "the experimental period of low-temperature treatment is past."

The first chapter takes the form of an introduction to the subject; and the authors say that the great mistake which has been made by the majority of those who have turned their attention to the invention of a process whereby the bye-products from coal could be obtained has been that they have set out with the idea of securing as great a variety of products from the coal as possible, instead of directing their energies into one definite line. The object which should be kept right in the forefront, they state, is that of producing the largest quantity of oil, and using whatever residual fuel is obtained for briquette manufacture, combining this with waste bituminous coal. The next chapter is devoted to early experiments in the destructive distillation of coal; and it is put forward that "in carbonizing coal for gas-making purposes and in heating it for the production of coke, what are to-day very valuable products are lost." We would remark here that, if in exchange for a shilling piece twelve coppers were received, the shilling would not be lost; and the mere fact that the authors of "Low-Temperature Distillation" prefer their shilling to be replaced by a sixpence and two coppers is no argument in favour of their plan. According to Messrs. North & Garbe, carbonization of coal is carried out for two chief purposes—one for the manufacture of illuminating or power gas, the other for the production of coke. "Illuminating gas," in view of the enormous and ever-extending use of gas for heating, is to-day a meaningless term.

Three chapters are devoted to descriptions of modern low-temperature plant and special points in modern practice; and others deal with the subjects of peat, lignite, oil shales, briquetting plant, treatment of the residue from distillation, and the materials available in Great Britain. Throughout the book considerable importance is attached to the need for carbonizing at really low temperatures, and stress is laid on the utilization of superheated steam as a distilling medium. In discussing the experiments which have been carried out by the Fuel Research Board, the authors suggest that the temperatures generally employed at the Board's station are not those from which the best results, as far as quantity and quality of the oil are concerned, may be obtained. Speaking of the tests made in connection with a South Wales gas coal, they say that "admirably as the work was done, and interesting as are the results, they do not add anything to our previous knowledge. The temperature employed was so high that the principal product was gas, with the result that the yield of oil was small. . . . It is curious that the Board, in view of the great need of this country for an oil supply, do not devote some attention to the temperatures at which this could be secured."

"Low-Temperature Distillation" is—as we have already mentioned—exceedingly well written; and it will be read with interest, profit, and enjoyment. If all do not fall in line with the opinions it expresses, at least it does put forward opinions—and this in itself is of the utmost value. An appendix to the book, in addition to a consideration of the production of oil from coal, anthracite, lignite, peat, &c., by "hydrogenation," contains many useful tables and results of tests.

* "Low-Temperature Distillation," by S. H. North and J. B. Garbe. Sir Isaac Pitman & Sons, Ltd. Price 15s. net.

Gas in Dental Surgeries and Clinics.—The current issue (No. 133) of "A Thousand-and-One Uses for Gas" shows the important part which heat plays in the various processes involved in the manufacture of dentures. It gives an interesting "peep behind the scenes" into the dental mechanics' workshop, and proves that, in almost every stage of the modelling and finishing of dentures, gas is required. The issue, with its numerous excellent illustrations, will be of interest to dental surgeons and others professionally engaged in this work.

ELECTRICITY SUBSIDIZING.

The Case of Great Yarmouth.

The idea that the Unemployment Grants Committee will, to help to relieve the workless, subsidize electrical schemes, no matter their nature, by paying over a long term of years 50 per cent. of the interest on the money expended, has tempted many electrical engineers to evolve projects and estimates. Some of these are vague, inconclusive, and absurd; and we think there will be a good deal of disillusionment and disappointment before the end is reached. If we are wrong in this, and those who have to deal with such schemes on behalf of the Government allow conditions such as have been assumed, for example, in the case of Great Yarmouth by the Corporation Electrical Engineer (Mr. P. G. Campling), in making estimates for a scheme involving an expenditure of close upon £200,000, then there would be good cause for a general revolt against this sort of thing on the part of the taxpayers, and especially those large ones who are in business competition with electricity supply concerns. It is not the duty of the Government to render financial aid to one industry to the detriment of another engaged in equally important public service.

In this article we intend to examine the estimates for the Great Yarmouth project; and we should like an answer to two questions: Have the Electricity Commissioners approved of the Great Yarmouth scheme? If so, have they agreed to the terms adopted by the Electrical Engineer for the repayment of the loans required for carrying-out the scheme—terms of years in some cases which are opposed to the practice of the Commissioners? We should not be surprised to learn that they have approved of the scheme from the technical point of view; we should be astonished to find that they have granted the whole of the periods of repayment upon which Mr. Campling has budgeted, and upon which periods the whole financial structure and outcome of the scheme rests. Then, assuming the Electricity Commissioners have concurred in the repayment periods (to which further attention will be directed presently), will the Unemployment Grants Committee pledge the Government to pay for fifteen years half of the interest involved by the proposed outlay, some of which it is intended to spread over the next three or four years?

Opportunism—Relation of the Scheme to Unemployment.

Before dealing with the financial aspects, there are one or two general observations we should like to make. Unemployment grants, we were under the impression, were intended for the specific purpose of giving work to the unemployed; but in this £200,000 scheme for Great Yarmouth, the specific purpose of the expenditure is not for the relief of unemployment, but to bring an effete electricity supply system up to approved modern standards. Such expenditure is entirely a matter for the undertaking itself; but the report of the Electrical Engineer, with its assumptions as to long-period repayments and a generously-disposed Government in the matter of grants, distinctly discloses an idea that the opportunity is a good one for setting the Great Yarmouth electrical house and system in order by the useful aid of national funds. It is clear that those who are looking after the electricity supply of Great Yarmouth are opportunists of the first water. But is this fair to other industries who are large taxpayers, and especially to the industry with which electricity is in keen competition?

There is another general point. It is that, as already said, the unemployment grants or subsidies were intended to assist employment in industries which are suffering seriously from lack of work; but we are not aware that this is the state of things in the electricity industry, or the part of it supplying plant. Thus any money the nation has to spare for subsidizing work should be directed to the most needy quarters. The heaviest part of this Great Yarmouth scheme proposes that the entire transmission, transforming, and distribution system should be converted to three-phase 50 cycle, which necessitates also rewinding and wiring motors, and changing meters and lamps, and involves an expenditure of £130,679, out of the total proposed outlay of £194,476. The whole of this work, it seems, would have to be done anyway to modernize the system, and fit it for the work it has to do; and therefore the scheme would have to be carried out whether or not subsidies are allowed. We cannot see the slightest justification for the Unemployment Grants Committee allowing any subsidy in the way of interest for any term or terms of years for any part of this work; if an exception is made for a single part, it should be restricted to the cost of the unskilled labour employed in the laying of the cables.

The Scheme.

To enable readers properly to appreciate the position, it should be mentioned that the present supply of electricity in Yarmouth is of the earliest character known as the single-phase system; and the Electricity Commissioners have refused to sanction further loans for extensions to this obsolete system. The Corporation have therefore resolved to change it from single phase to three-phase alternating current. Hence the report of the Electrical Engineer, recommending a scheme (including a new generator, converter, and boiler plant), and involving a total estimated cost of £194,476. The Electricity Committee and the Council have accepted the report; and there seems to be an understanding among the members of the latter that the Electricity Commissioners have also approved the scheme. From an engineering and technical point of view, that may be so; but we cannot think the Commissioners have had before them the financial side of the proposals as submitted by the Electrical Engineer, or, if they have, we cannot believe they have given their approval to it.

Uncertain, but Worth the Attempt.

Dealing with the financial weaknesses of the scheme, we cannot do better than begin by quoting the following passages from the report of the Electrical Engineer:

> From information obtained, the Unemployment Grants Committee are likely to assist in this scheme to the extent of 50 p.ct. of the interest for a period of fifteen years, *in view of which I should attempt to get sanction for the whole scheme.*

> By adopting the entire scheme, you are making provision for the future, modernizing your power station and distribution systems, by which increased revenue may be earned, and the outlay will effect savings equivalent to £12,500 per annum. Against this we have . . . estimated loan charges which show that it is possible to do all this modernizing and be approximately £2000 to the good.

There are two or three striking points about the foregoing extract. The first is the uncertainty as to what the Unemployment Grants Committee will do. They "are *likely* to assist in this scheme to the extent of 50 p.ct. of the interest for a period of fifteen years." A more likely thing is that they will not do anything of the kind when they learn of the opportunism underlying this project, as revealed by the naive statement: "In view of which [that is, what the Grants Committee are 'likely' to do] I should *attempt* to get sanction for the whole scheme." The suggestion of an "attempt" indicates an uncertainty in the mind of Mr. Campling as to whether there will be success in this. The "likely" assistance shows the frailty of the foundation upon which the financial structure of the scheme (as given in the report) rests—a scheme which, in every particular, should have its costs charged against the undertaking itself, and not be subsidized from any external source. We are afraid that—deducting the hoped-for savings from the charges based upon long repayment periods and the scooping-in from national funds of 50 p.ct. of the interest for fifteen years—the "£2000 to the good" is an aspiration for the fulfilment of which the chances are very slight. The Electrical Engineer finds the scheme will effect savings of £12,500, and the total of the interest and sinking fund charges will be £15,408, showing an annual deficit on the working of £2908. But if the Unemployment Grants Committee allows a grant of 50 p.ct. of the interest (which amounts to £9679), this would give £4840, from which the deficit of £2908 could be deducted—thus showing a profit per annum of £1932, or (say) £2000. That is really humorous. We were unaware that the Unemployment Grants Committee were appointed to help to put profits into the pockets of electricity undertakings. Of course, the estimated advantage all depends on the repayment periods allocated to the loans by the sanguine Electrical Engineer and the generosity of the Grants Committee.

Loan Periods.

Next let us consider the loan periods—optimistically hoped-for and probable! The Electrical Engineer of Great Yarmouth has a good opinion of plant longevity, and of the "capital" value of replacements of appliances in the possession of consumers. There is little doubt he has gone far beyond what is probable in this matter. For a new steam pipe system, he has assumed a 25-year repayment period; 15 to 20 years is likely to represent the maximum allowed by the Electricity Commissioners. While he takes 30 years for a water-circulating system, the maximum usually allowed by the Commissioners is 15 to 20 years. The estimate of 15 years for a generator and 20 years for a converter will no doubt be realized. But 25 years for boiler plant may have a maximum of 20 years applied to it. The Electrical Engineer is probably right with 25 years in respect of cabling and sub-stations; but to take 25 years for rewinding and wiring motors and changing meters and lamps is absurd. The maximum is 3 to 5 years. These three items—rewinding motors and changing meters and lamps—it is calculated, will represent an outlay of £23,104. This amount of expenditure is merely to substitute something at present existing, and is to all intents and purposes a gift to the consumers; there is no capital value represented by the outlay either to the undertaking or the consumers. Therefore, is it likely the Electricity Commissioners will allow a repayment period of 25 years for these items? Is there any definite knowledge that maxima repayment periods based upon precedents will be allowed by the Commissioners in respect of all the other items of expenditure? About the Engineer's estimates, indefiniteness is, in our opinion, a prominent feature. His computed profit, too (which has no doubt caused some of the councillors to thank heaven for a highly considerate Government with a charming preference for things electrical), is further built on the mere hypothesis that the Unemployment Grants Committee will make a

grant of 50 p.ct. of the interest for fifteen years. As already indicated, we fail to see how the Committee can make a grant of interest on capital for such things as changing consumers' meters and lamps and rewinding motors.

Supposing There is No Grant.

There is thus something beautifully problematical about the repayment periods and the extent of the grant of interest. However, for the sake of argument, allowing for a grant of 50 p.ct. of interest in all cases, and adjusting loans to the maximum periods, we find that a total of £14,613 would be required to meet loan charges and interest. Deducting from this the estimated savings of £12,500, instead of a profit of £2000, we arrive at a deficit of £2113. Supposing the grant of £4840 towards interest is not obtained, the annual total required to meet loan charges and interest would be £19,453, which would leave a deficit of £6953, or roundly £7000, as compared with the Engineer's estimated profit of £1932. We cannot think that the Unemployment Grants Committee have led the Corporation to believe that a grant of 50 p.ct. of the interest will be allowed for a period of fifteen years on the total expenditure of nearly £200,000. Nor can we imagine that the Electricity Commissioners will sanction loans for periods of 25 years for rewinding motors and changing meters and lamps. If assurances of the kind have been given, then it is time such unsound finance and preferential treatment of an industry was exposed by every available means, and the strongest possible protest made in the proper quarters by those adversely affected. Among those adversely affected are the taxpaying gas undertakings of the country and their customers. However, if the authorities do their duty, the financial estimates of the Electrical Engineer of Great Yarmouth will undergo considerable modification before the scheme he has drawn up issues from their hands.

THE INSTITUTION OF GAS ENGINEERS.

Council Meeting.

A meeting of the Council was held at No. 28, Grosvenor Gardens, Westminster, on Monday, April 6; the chair being taken by Mr Charles F. Botley, Senior Vice-President, owing to the absence through indisposition of the President, Mr. J. Ferguson Bell.

There were also present Mr. John Wilkinson, O.B.E. (Vice-President); Messrs. James E. Blundell, J. Wesley Whimster, John M. Campbell, John W. M'Lusky, Charles S. Shapley, C. Dru Drury, and John Terrace (ordinary members of the Council); Messrs. Edward F. Keable (Eastern Counties Association), Harold Davies (Manchester District Institution), James Campbell (North British Association), and Leonard J. Langford (Southern Association); Messrs. Samuel Tagg, J.P., and Thomas Hardie (Past-Presidents); and Mr. W. E. Price (Hon. Secretary).

In opening the proceedings, the Chairman made a feeling reference to the death of Mr. Harry E. Jones, Past-President, and Mr. A. F. Brown, member of the Institution, which had occurred since the last meeting; and the Council's sympathy was suitably expressed.

A message to H.R.H. the Prince of Wales, on his departure for West Africa, was reported, together with the reply to it which had been received from the Prince.

It was resolved to recommend to the members at the forthcoming annual meeting that the sum of £100 be voted to the fund for establishing a memorial to the late Lord Moulton, Past-President of the Institution. Its object is to obtain the sum of £3500 for the conversion of the schoolroom at Kingswood School, Bath, in which Lord Moulton spent so much of his time when a schoolboy, into a memorial hall.

The following candidates were approved for the ballot-list to be issued in connection with the annual general meeting:

For the Class of Member—Messrs. G. E. Anderson, Newcastle-on-Tyne; R. L. Atkinson, Newcastle-on-Tyne; C. Breaks, Ellesmere Port; H. W. Dean, Padiham; John Domain, Ripon; J. E. Dixon, Newcastle-on-Tyne; G. W. Perks, Stockton-on-Tees; and N. Reid, Redheugh.

For the Class of Associate Member—Messrs. A. P. Alexander, South Bank; W. Bell, Reading; F. J. Bengough, Birmingham; E. Birch, Stockton-on-Tees; J. R. Cleator, South Bank; H. E. Cowles, Nechells; W. C. Kimpster, Newcastle-on-Tyne; T. R. Mortimer, Brighouse; and F. Nicholls, Gateshead-on-Tyne.

For the Class of Associate—Messrs. H. P. Clark and F. S. Townend, of London.

The following associate members were approved for transference to the class of member: Messrs. H. Curtis, Macclesfield; D. Muir, Pontypridd; and George Walmsley, Londonderry.

The nomination of officers and ordinary members of Council, for election at the annual meeting, was proceeded with; and it was resolved unanimously that the following be nominated:

President—Mr. Charles F. Botley, Hastings.

Vice-President—Mr. H. D. Madden, Cardiff; the Vice-President remaining in office being Mr. John Wilkinson, Nottingham.

Hon. Secretary—Mr. W. E. Price.

Auditors—Mr. S. Y. Shoubridge and Messrs. Wood, Drew, & Co.

Ordinary Members of Council—Messrs. J. H. Canning, O.B.E., Newport, and Harold E. Copp, Hull.

Members nominated in pursuance of article 40 as ordinary members of Council were reported as follows: Messrs. C. R. Armitage, London; W. H. Bennett, Redhill; George S. Frith, J.P., Runcorn; Leonard J. Langford, Tunbridge Wells; Samuel Shadbolt, South Bank; and Charles H. Webb, M.Sc., Stourbridge.

It was resolved that the London Gold Medal relating to papers read last year should be awarded to Mr. R. E. Gibson, for his paper on "The Construction of New Coal-Gas Works at Garston."

It was reported that the late Mr. Harry E. Jones, the donor of the London Gold Medal, just previously to his lamented death, had transferred to the Institution stock of the Uxbridge, Maidenhead, Wycombe, and District Gas Company, the interest of which would provide for the future award of this medal year by year. The thanks of the Council were expressed, and it was agreed that permission be sought for the medal to be known in future as the "Harry E. Jones London Medal."

The interim report of the Wrought-Iron Tubing Inquiry Committee was presented; and it was reported that the metallurgist appointed to draw-up a specification had just delivered it. This was referred to the Committee for consideration.

The Joint Committee on the Standardization of Gas Flanges presented their report, in which it was stated that agreement had been arrived at between the Committee and the British Engineering Standards Association. Particulars of the standard flanges would shortly be published.

A conference was reported, at which the Institution was represented by Mr. F. W. Goodenough and the Secretary, which had been organized by the Association of Teachers in Technical Institutions on the subject of the "Relationship of Technical Education to other forms of Education and to Industry." An invitation for the appointment of two representatives of the Institution to assist further in this matter was accepted; and it was resolved that their appointment be left with the Advisory Committee on Education.

It was reported that the Transactions of the First World Power Conference had been obtained for the Library for reference purposes; it being recognized that their contents would be of great value to the Institution.

In response to a request of the Non-Ferrous Research Association, it was agreed that the sum of £10 10s. be subscribed in aid of their funds.

Arrangements for the ensuing meeting of the Gas Investigation Committee were considered; and the suggestion that it be held at Leeds on Thursday, May 21, was approved. This arrangement would enable the Committee to inspect the Corbet-Woodall test plant in operation.

It was resolved that the Institution of Gas Engineers should become an affiliated member of the Smoke Abatement League of Great Britain, and that the President and the Senior Vice-President be appointed delegates.

An invitation from the Royal Sanitary Institute for the Institution to appoint two delegates to attend their Congress at Edinburgh from July 20 to 25 was accepted, and Mr. John W. M'Lusky, Glasgow, and Mr. James Campbell, Dunfermline, were appointed to attend.

The details of the arrangements for the forthcoming annual general meeting were considered, including the organizing of the various visits on Thursday afternoon, June 11, and to Derby on the following day.

Blinded Soldiers as Telephone Operators.

It may not be generally known that one of the most successful occupations taught to the blinded soldiers at St. Dunstan's is telephone operating. A large number of these men have found employment with important business firms and organizations in London and the Provinces; and not a few employers state that their boards have never been so well and efficiently managed as by their blinded soldier operator. This may be because the freedom from outward distraction—a natural accompaniment of blindness—enables the blind operator to concentrate on his work to a much higher degree than is possible for a sighted operator, and thus he can maintain an excellent service. St. Dunstan's have several fully-trained men ready for work. There may be some readers faced with a necessary change in their present arrangements who might like to give a St. Dunstan's operator a trial. If so, the authorities at St. Dunstan's Headquarters (Inner Circle, Regent's Park, London, N.W. 1) will gladly supply full particulars. A point to bear in mind is that the employer's liability for his blinded soldier operator is no more than for an ordinary employee. To his employer he is a perfectly normal member of the staff. His special needs as a blinded ex-Service man are the permanent and sole responsibility of St. Dunstan's After-Care Organization.

THE JAPANESE EARTHQUAKE OF 1923.

Effects on the Tokio Gas Company.

Tokio suffered severely in the great earthquake which caused so great a loss of life and property in Japan during September, 1923, and of this a full share, of course, fell to the lot of the Tokio Gas Company, who, however, struggled with their difficulties in a manner deserving of the fullest possible praise.

Sunamachi Works.

Fukagawa Works.

Fukagawa Works.

GENERAL VIEWS OF THE CONDITION OF THE WORKS AFTER THE EARTHQUAKE.

An idea of the effect of the earthquake on the Company's works and property generally will be gathered from the accompanying series of photographs, for which we are indebted to Mr. K. Sato, who has recently been visiting this country investigating modern methods of gas manufacture, in order to arrive at some definite conclusion as to the types of plant which, in the circumstances, it is preferable for the Company to adopt.

The total capacity of the plants of the Tokio Gas Company—who have five manufacturing stations and two bye-products works—may be placed at about 25 million c.ft. of gas a day, for the supply of the city and suburbs, and the mileage of mains at some 1670. Much damage was done to the 3 million c.ft. per day Koppers coke oven plant at the Omori Works, and to the 2 million c.ft. per day vertical retort installation at the Shiba Works. Damage to a more or less serious extent was also caused to the horizontal, inclined, and vertical retort installations in three other works.

Effect on the Holders.

One of the strangest effects of the earthquake, so far as the gas-works was concerned, was in connection with the holders. Friction resulting from the earth movements caused the emission of weird sounds, and water was discharged in huge quantities. The sight was a terrible one, but closer investigation revealed the comforting fact that the damage was less extensive than at first appeared probable. Particularly in the case of the larger holders, having a capacity of (say) over 1½ million c.ft., the actual damage was really trifling—only the guide-rollers being thrown out of gear. From this experience it may be

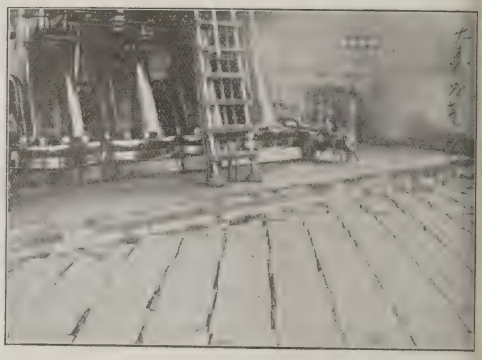
How Coal-Feeding Hopper was Broken Down.
Of the 72 cast-iron hoppers, no fewer than 30 were broken.

View, from below, of a Broken Down Vertical Retort.

Photograph showing how the Generators were Left.

Side View of Retort Bench.

End of a Bench of Nine Settings.



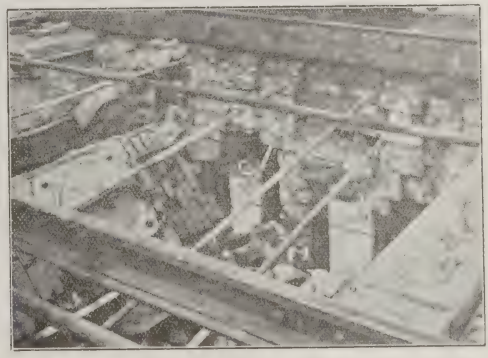
Omori Works—Diesel Engine Power Plant.

It will be observed that under these engines the foundations are of a very solid character, being constructed of concrete. The portion of the floor in the foreground was not constructed in the same way, and suffered considerable disturbance.

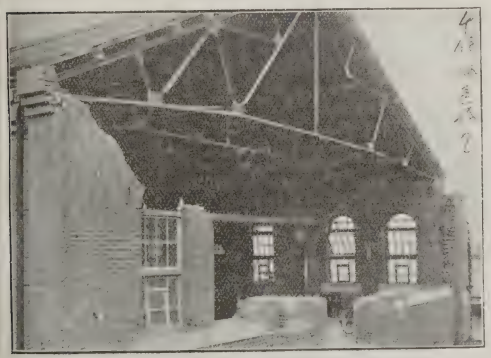
SPECIMEN GAPS IN THE DISTRIBUTION SYSTEM.

The first photograph is of the 36-in. main in the Omori Gas-Works.

TAR DISTILLATION PLANT AT THE SARUYE WORKS IN TOKIO.
This plant suffered considerable damage.



WRECK OF THE KOPPERS OVENS AT THE OMORI WORKS, NEAR TOKIO.
These ovens had a daily capacity of 3 million c.ft.



SPECIMEN PHOTOGRAPHS OF BUILDING WRECKAGE.

concluded that the construction of a gasholder is sufficiently elastic to enable it to withstand even such a shock as results from a very big earthquake.

Generally speaking, the foundations of the machinery and plant were but little affected; and this applies particularly to the foundations of the settings and gasholders. Therefore the damage to the settings already referred to may be assumed to have been due to oscillation of the structure, and not to the giving way of the foundations themselves.

Of the other plant, that most seriously damaged was a purifying box at the Omori Works, 35 ft. by 120 ft. by 6 ft., made of cast iron and supported by reinforced concrete pillars. The damage to the mains consisted principally of loosened and drawn joints; and the Company have therefore deemed it wise to make careful investigation with a view to ascertaining what may be the most suitable form of joint for future use.

Gas Supply Ceases.

Immediately following upon the earthquake, fire broke out, and from this cause the gas supply was stopped. The most serious damage sustained by fire was, however, in connection with the bye-product plant at the Saruye Works. The holders within the area which was affected by the conflagration remained unaffected—indeed, by acting as a screen, they exercised a restraining influence upon the progress of the flames.

At first it was uncertain how long the gas supply would have to be discontinued, owing to the serious destruction caused by both earthquake and fire; but within three weeks of the disaster, the Company were able to restore the supply to a small district in the city, and within two months the whole of the area was again receiving gas. This indicates the great energy and enterprise displayed by the engineers of the Company in this devastating emergency. The work naturally had to proceed uninterruptedly day and night. It was of a very strenuous character; and, of course, what was then done was of a temporary nature.

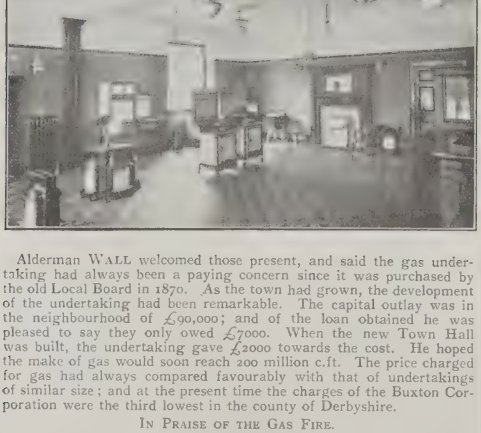
Extensions Contemplated.

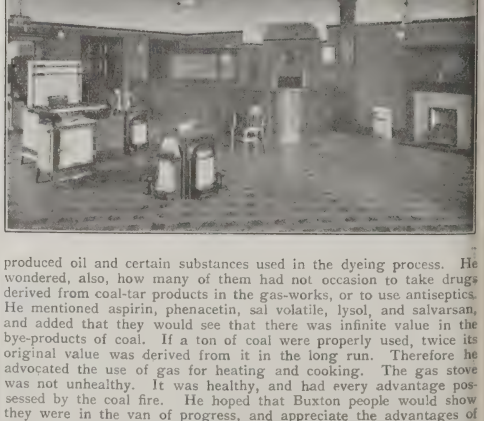
The demand for gas by the citizens is continually growing, and to meet this a scheme has been prepared to extend the capacity from the present 25 million c.ft. daily to some 75 millions.

GAS SERVICE BUILDINGS AT BUXTON.

Official Opening.

New Gas Service Buildings on Eagle Parade, Buxton, were officially opened on Wednesday, April 8, by the Mayor (Alderman C. W. Buckley, J.P., M.D., London, M.R.C.P.), who was accompanied by the Mayoress. There were also present a number of members of the Council, officials, and others—including Alderman A. W. Wall (the Chairman of the Gas and Water Committee of the Buxton Corporation) and Mr. F. G. Shaw (the Gas Engineer and Manager). In the course of the proceedings some remarks on gas heating were made by the Mayor, to whose views on the subject great weight attaches by reason of the fact that he is a distinguished consultant on rheumatism, gout, and allied diseases, University Lecturer on Balneology (on which he is a world-renowned authority), and a Director of the Biological and Bacteriological Research Laboratories of the Devonshire Hospital, of which he is also Honorary Physician.





Alderman Wall welcomed those present, and said the gas undertaking had always been a paying concern since it was purchased by the old Local Board in 1870. As the town had grown, the development of the undertaking had been remarkable. The capital outlay was in the neighbourhood of £90,000; and of the loan obtained he was pleased to say they only owed £7000. When the new Town Hall was built, the undertaking gave £2000 towards the cost. He hoped the make of gas would soon reach 200 million c.ft. The price charged for gas had always compared favourably with that of undertakings of similar size; and at the present time the charges of the Buxton Corporation were the third lowest in the county of Derbyshire.

In Praise of the Gas Fire.

The Mayor (having unlocked the door of the new showroom) expressed his pleasure at performing the opening ceremony in connection with this new venture of one of the most profitable undertakings of the town. Gas, owing to the enterprise which had always marked the undertakings of the country, had developed into a science of heating to an extent which had been of the greatest possible benefit to the country. He was disposed to say that there was no more efficient method of heating in the present day than by gas. He indicated the advantages in the household of gas over coal, and said that gas would help to dispose of the smoke problem. The smoke problem in Buxton was not so serious as in some towns; but it was quite serious enough. They knew of what value sunlight was to the nation and the individual, especially the children. Therefore he wanted them to do all they could to eliminate smoke from the atmosphere; and the method ready to hand was the use of gas for domestic heating and cooking. The Corporation realized that the first step towards the solving of the smoke problem was to put their own house in order. They had done this, and now it was their duty to point out that black smoke could be avoided by the use of gas for heating or coke for furnace purposes. Black smoke also meant a serious waste of fuel. Ten tons of coal purchased at about 35s. per ton would produce more than 130,000 c.ft. of gas, which meant, at the present price of gas, that the gas produced would be of greater value than the coal placed in the retorts. In addition, 10 tons of coal produced 7 tons of coke, 175 gallons of ammoniacal liquor, and 100 gallons of tar, which in turn produced oil and certain substances used in the dyeing process. He wondered, also, how many of them had not occasion to take drugs derived from coal-tar products in the gas-works, or to use antiseptics. He mentioned aspirin, phenacetin, sal volatile, lysol, and salvarsan, and added that they would see that there was infinite value in the bye-products of coal. If a ton of coal were properly used, twice its original value was derived from it in the long run. Therefore he advocated the use of gas for heating and cooking. The gas stove was not unhealthy. It was healthy, and had every advantage possessed by the coal fire. He hoped that Buxton people would show they were in the van of progress, and appreciate the advantages of gas by extending its use in their households.

Alderman Clark, J.P. (the Chairman of the Chesterfield Gas Committee), congratulated the Buxton Gas and Water Committee, and said the management of the Gas Department was efficient.

Mr. J. Mason Frith, J.P. (the Chairman of the Runcorn Gas Company), also congratulated the Committee on the fitting-up of so fine a building for the purposes of gas service.

The Mayor, Alderman Clark, and Mr. Mason Frith were thanked for their remarks; and silver salvers were presented to the Mayor and Alderman Wall by Mr. Shaw, who thanked the Corporation for the way in which they had supported him. The Mayoress was presented with a handsome bouquet by Mrs. Shaw.

The company afterwards inspected the buildings, and subsequently took tea at the Eagle Hotel.

Coping with Growing Demands.

Modern conditions and the ever-increasing use of labour-saving gas appliances have called for improved methods of catering for the consumers; and with the expansion of Buxton new premises for the distribution department have been urgently needed for many years. Soon after his appointment in 1911, Mr. Shaw reported on the matter, and the old gas showroom was opened in 1914—the war preventing developments then in contemplation. Soon after the end of the war the matter was frequently before the Gas Committee; and after many schemes had been considered, a portion of the Old Devonshire Hotel was acquired. The site presented many advantages. It enabled the workshops, offices, stores, and showrooms to be concentrated in one building, with proper supervision and control, and provided a good display site near the Town Hall. The workshops are reasonably isolated from surrounding property. A further valuable portion of the scheme is the provision of three workmen's flats on the second floor; and these are occupied by employees of the department, who are at constant call at night for urgent repairs and other emergencies.

The whole of the work of reconstruction has been carried out by the Gas Engineer and his staff, with the aid of local contractors, and has been paid for out of revenue.

New Showrooms, Offices, and Workshops.

Before the move to the new offices, the staff was split-up. The fact of having all the departments under one roof will make both for economy and efficiency; and, what is even more important, the fine showroom and demonstration room will materially assist the department in their progressive sales policy. The appointments of the ground floor showroom and office are in oak. To the right upon entering is a semi-circular counter and the office accommodation for the clerks. From the showroom, a staircase leads to a small waiting room and the demonstration room, in which are many gas appliances in full working order.

The portions of the building already referred to are those which will be seen by the public. Returning to the ground floor, a long corridor leads to the back of the building—workshops and stores being situated on either side. The stores are also on this floor.

On the first floor, behind the demonstration room, are the Gas Manager's office and other offices, the public lighting department and street lamp store, stock rooms, the official gas testing station, &c.

INSTITUTION OF GAS ENGINEERS.

EDUCATION SCHEME.

By Walter Hole, Organizing Secretary.

Now that the revision of the scheme is completed, it is thought that a brief description, setting forth the whole of the arrangements in the simplest possible language, may be acceptable to those for whom the scheme is intended.

The junior educational work of the Institution is now grouped in three main divisions—viz.:

I. Craftsman's division, dealing with gasfitting.
II. Intermediate division.
III. Professional division.

I. Gasfitting Course.

The first division deals with the training of gasfitters as craftsmen, and is arranged in conjunction with the City and Guilds of London Institute. The course for this subject, which is open to lads of 16 years of age and upwards, runs for five years. Instruction is given not only in the technics of gasfitting and the utilization of gas, but also in the elements of the sciences upon which those technics are based. The examinations consist of written, practical, and *viva voce* tests. The certificates gained in the final year of the course will be endorsed by the Institution of Gas Engineers, and will therefore be a very valuable possession of the successful candidate. Full particulars of the regulations, syllabuses, and centres of instruction may be obtained from Mr. C. C. Hawkins, Superintendent, Department of Technology, City and Guilds of London Institute, No. 29, Roland Gardens, Old Brompton Road, London, S.W. 7.

II. Minor Grouped Courses in Gas Engineering and Gas Supply.

There are many men in the industry, alike on the works, on the district, and in the office, who cannot see their way, or have no desire, to qualify for professional status on the commercial or engineering sides of the industry, but who are desirous of learning more of the processes and transactions of the industry in which they are daily engaged. For these, Minor Grouped Courses have been arranged in conjunction with the City and Guilds of London Institute, under the following heads:

1. Gas-works practice.
2. Gas supply practice.

The course for each of these runs for two years, with an examination at the end of the second year, and comprises instruction in the general principles and elementary details of gas-works practice or gas-supply practice, and in the sciences of mechanics, physics, and chemistry, of which gas manufacture and supply are practical applications. By taking an additional year's tuition, a successful candidate in gas-works practice may be admitted to the examination in gas supply practice, and *vice versâ;* so that in three years anyone desirous and capable of so doing may obtain certificates in both subjects. All certificates gained in these examinations will be endorsed by the Institution of Gas Engineers.

Provision has been made in this section for isolated students—those so unfortunately placed geographically that they cannot possibly attend any of the classes arranged. These may apply for examination to the City and Guilds of London Institute through the local education authority. If the candidate is accepted, and is successful in the examination, he will be awarded a City and Guilds Certificate; but this will not be endorsed by the Institution of Gas Engineers. Any further information regarding these Minor Grouped Courses, together with a list of the schools at which instruction is provided or examinations are held, may be obtained from Mr. C. C. Hawkins.

III. Professional Courses.

The third division is concerned with professional training in both gas engineering and gas supply. Each of these subjects is divided into three grades—the Ordinary, the Higher, and the Diploma.

The regulations for the Ordinary Grade require attendance in a course occupying not less than 150 hours per annum for three years. Such a course includes, in addition to gas engineering and gas supply, instruction in foundation subjects such as mathematics, physics, chemistry, and/or engineering, upon which the successful study and practice of gas engineering or supply depends. At the end of the three years' course the student is examined, and, if successful, receives the Ordinary-Grade Certificate in Gas Engineering or Gas Supply, which indicates the ancillary subjects studied, as well as the degree of success attained in the main subject—namely Distinction, First Class, or Second Class. These Certificates are issued by the Institution of Gas Engineers, signed by the President and Secretary, and endorsed by the Board of Education.

The course for the Higher-Grade Certificate in both gas engineering and gas supply occupies another two years of not less than 150 hours per annum, in which further instruction in the ancillary subjects previously studied, or in alternative subjects, is given, in addition to the main subjects of gas engineering or gas supply. As a general rule it is recommended that a student in gas engineering taking an Ordinary Grade Course in which special emphasis is found to be laid upon chemistry should devote himself to engineering subjects in the Higher Course, and *vice versâ*.

Entrance to the Higher Course is restricted to those who possess either the Ordinary-Grade Certificate, or some equivalent qualification, such as the National Certificate (Ordinary) of the Institution of Mechanical Engineers or of the Institute of Chemistry. No one may be awarded the Higher-Grade Certificate who is not engaged on the practical (as distinguished from the clerical) side of the main subject of study (gas engineering or gas supply). As in the Ordinary Grade, the Higher-Grade Certificate is awarded by the Institution of Gas Engineers, endorsed by the Board of Education, and will denote the class (Distinction, First Class, or Second Class) in which the candidate has been placed, and the ancillary subjects studied.

Courses in one or both of the above subjects and grades are being provided at the following Technical Institutes: Bath Municipal Technical College, Barnsley Technical School, Birmingham Municipal Technical School, Blackburn Municipal Technical College, Bournemouth Municipal College, Bradford Technical College, Bristol Merchant Venturers Technical College, Burnley Municipal College, Derby Municipal Technical College, Dewsbury Technical College, Glasgow Royal Technical College, Halifax Municipal Technical College, Huddersfield Technical College, Leeds Central Technical School, Regent Street Polytechnic and Westminster Technical Institute (London), Manchester Municipal College of Technology, Plymouth Municipal Technical School, Portsmouth Technical College,

Salford Royal Technical College, and Stoke-on-Trent Central School of Science and Technology.

Where convenient and advisable, the earlier years of the course may be taken at other schools, with the previous consent of the Advisory Committee.

The Principal of any of the foregoing schools will be pleased to give the fullest information to intending students.

The exact character of the courses taken varies naturally with local circumstances and conditions. Perusal of the following courses of study which are being taken at three of the above Colleges will, however, be an indication to students of the lines upon which the Education Scheme is being worked.

Typical Courses in Gas Engineering.

	Senior Course.			Advanced Course.	
	1st Year.	2nd Year.	3rd Year.	1st Year.	2nd Year.
A	Mathematics Physics Th. and Pr. Chemistry Th. and Pr.	Physics Th. and Pr. Inorganic Chemistry Th. and Pr. Organic Chemistry Th. and Pr.	Physical Chemistry Th. and Pr. Organic Chemistry Th. and Pr. Gas Engineering		
B	Mathematics Physics Th. and Pr. Chemistry Th. and Pr.	Mathematics Physics Th. and Pr. Chemistry Th. and Pr.	Chemistry Th. and Pr. Chemistry of Gas Manufacture Gas Engineering	Chemistry Th. and Pr. Gas Engineering	Chemistry Th. and Pr. Gas Engineering
C	Mathematics Physics Th. and Pr. Chemistry Th. and Pr.	Mathematics Physics Th. and Pr. Chemistry Th. and Pr.	Inorganic Chemistry Th. and Pr. Organic Chemistry Th. and Pr. Gas Engineering Drawing	Mathematics Mechanics Th. and Pr. Engineering Drawing	Building Construction Mechanics and Heat Engines Th. and Pr. Gas Engineering

Typical Course in Gas Supply.

	Senior Course.			Advanced Course.	
	1st Year.	2nd Year.	3rd Year.	1st Year.	2nd Year.
D	Mathematics Physics Th. and Pr. Chemistry Th. and Pr.	Mathematics Physics Th. and Pr. Chemistry Th. and Pr.	Mechanics Th. and Pr. Building Construction Gas Supply	Building Construction Mech. and Electrical Technology Gas Installation Work Gas Supply	Physics or Building Construction Gasfittings Design Gas Supply

It is, of course, understood that the above Senior Courses refer to the Course for the Ordinary-Grade Certificate, and the Advanced Courses to that for the Higher-Grade Certificate.

Section II.

It is hoped that year by year the above list of colleges providing instruction in gas subjects will be gradually increased until personal tuition in these subjects will be within the reasonable reach of all but the most exceptional cases. Meanwhile it is obvious that considerable areas of the country are at present untouched. Provision has therefore to be made for the certification of those to whom attendance at classes in gas engineering or gas supply is absolutely impossible. These are provided for in section II. of the scheme.

Under the provisions of this section, students who can satisfy the Advisory Committee that it is impossible, owing to geographical position, for them to attend the Grouped Courses arranged under section I., and who at the same time are also able to satisfy the Committee, either by the production of certificates gained, or by the voucher of the principal of an approved school, that they have attained the requisite standard in any three of the specified ancillary subjects (mathematics, chemistry, physics, mechanics, machine drawing, building construction, and heat engines) may be allowed to sit for examination in gas engineering or gas supply.

For the Ordinary Grade this requisite standard in ancillary subjects has been defined as "not inferior to that of the third-year senior course of an approved technical school." The examinations are of standard equal to (and are held at the same time as) those under section I. The successful candidate is awarded a Certificate by the Institution of Gas Engineers, signed by the President and Secretary, showing the degree of success obtained, and the ancillary subjects studied, but which is not endorsed by the Board of Education.

The examination is restricted to those who have been engaged on the practical side of the main subject of study (gas engineering or gas supply) for at least one year previously. Forms of application to sit for these examinations, and any further information necessary, may be obtained from the Organizing Secretary, Mr. Walter Hole, "Wharfedale," Barton, Torquay. The forms must be returned not later than the last day of February in any year.

Entrance to the Higher-Grade Examination in either gas engineering or gas supply under section II. is restricted to those who have

(*a*) been engaged on the practical side of the main subject of study (gas engineering or gas supply) for at least three years;

(*b*) obtained the Ordinary-Grade Certificate in the subject of examination; and

(*c*) are able to satisfy the Committee that they have received and profited by further instruction in the ancillary subjects taken for the Ordinary Grade, or, alternatively, in others approved by the Advisory Committee.

The questions in this section are the same as for the corresponding grade in section I., and the examinations are held at the same time. Successful candidates are awarded a Certificate signed by the President and Secretary of the Institution of Gas Engineers, denoting the degree of success obtained (Distinction, First Class, or Second Class) and indicating the ancillary subjects studied; but this Certificate is not endorsed by the Board of Education.

In both the Ordinary and Higher Grades in this section an examination fee of one guinea is charged. Application forms and any further information may be obtained from the Organizing Secretary.

Diploma.

The Diploma is the crown of the whole scheme, and is the highest certification granted within the industry. The Diploma may be obtained in either gas engineering or gas supply, and denotes that the holder not only has high academic attainments, but also possesses practical experience and skill. Examination for the Diploma is restricted to those who

(*a*) are actually engaged in the industry;

(*b*) are 23 years of age or more;

(*c*) have obtained the Higher-Grade Certificate in the subject of examination and the Ordinary-Grade Certificate in the sister subject (gas engineering or gas supply);

(*d*) have passed the Matriculation Examination of any recognized British University, or possess the Higher School Certificate A or B, or have attained other general educational qualifications of not lower standard.

The examination is divided into three portions—viz., the written, the oral, and the presentation of a thesis. The last-mentioned, if the candidate is a gas engineering student, must consist of an original paper on some point of gas-works construction or gas manufacture. If the candidate is a gas supply student, it must take the form of an original paper on some point of gas distribution, supply, or utilization. The thesis must be sent to the Organizing Secretary at least four weeks before the date of the written examination.

The oral portion of the examination is directed to eliciting the candidate's personal experience and capacity to deal with the various difficulties, emergencies, and problems which are continually being met with in actual practice—qualifications which cannot be determined so well by any written paper.

No candidate who already possesses an approved degree in gas engineering in a British University is required to sit for the written portion of the Diploma examination. But he is required to present a thesis or published work of his own; to submit himself to a *viva voce* examination; and to produce evidence of professional experience satisfactory to the Advisory Committee.

As in section II., an examination fee of one guinea is charged in the Diploma division.

Application forms for entrance to the examination, and any further information required, may be obtained from the Organizing Secretary, Mr. Walter Hole, "Wharfedale," Barton, Torquay.

A Meter Connection Protector.—A patent has been taken out in the United States by Mr. G. H. Sauton in connection with a device for completely enclosing and locking the coupling unions or nuts of the connecting pipes of a gas meter, in order to obviate any possibility of tampering with the couplings by unauthorized persons. The enclosing device is fastened by a concealed lock, which it is said will resist all tampering efforts of wires, &c., for the purpose of unfastening it. The intention is to number serially each meter protector, and to supply only one number of each series to any one gas undertaking. Thus, in the event of a customer breaking a protector he will be unable to replace it, as the meter reader will be instructed to insert the number of the protector on his sheet at each reading of the meter. The device is so constructed that it can be preserved whenever a meter is changed.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

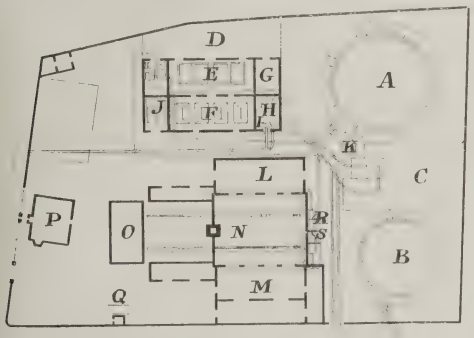
PRESIDENTIAL ADDRESS OF MR. F. A. WEST, OF NEWARK (APRIL 22).

During the 37 years the Eastern Counties Gas Managers' Association has been in existence it has fulfilled its object with distinction. This must be a source of pride and satisfaction to the few remaining original members, who first laid the foundation of this combined effort for progress and the future development of the gas industry in the Eastern Counties.

The District Associations continue to play an important part in the scientific advancement of the industry; and the complex nature of a modern gas engineer's duties tends to make it more necessary than ever to maintain these Associations in a high state of efficiency, so that the problems and experiences met with in various works can be mutually discussed and progress made on the right lines. The more scientific methods of manufacture and distribution, and the wider choice of plant available, make it difficult for an engineer responsible for the economic and sound administration of his undertaking to decide on future extensions. It is only by mutual service to each other that we can maintain the high reputation which has placed the industry in its present sound position.

Newark Gas-Works.

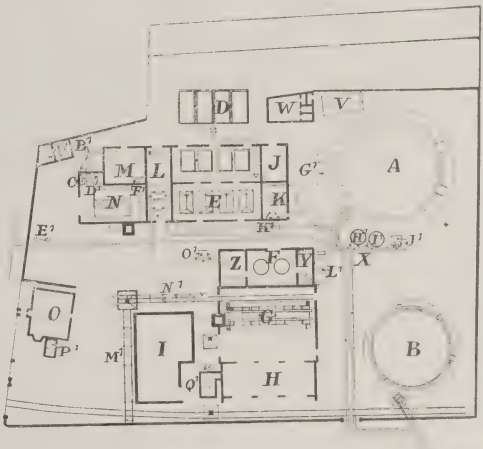
The Newark gas undertaking has been in existence 90 years, and during that period has experienced both prosperous and lean times. You have had an opportunity to-day of examining the present works. When I took charge, they were perhaps one of the last remaining examples of the old school. The main retort house was direct fired and hand charged, and all the rest of the plant dated from the same period. The plant was originally designed for an output of 300,000 c.ft. per day. The entire works have recently been reconstructed on the existing site; and with the exception of utilizing existing buildings, there is practically nothing of the old works left. In the gradual rearrangement of plant on the existing site, and carrying out one's statutory obligations at the same time, advantage cannot always be taken of placing various apparatus in the best relative positions. However, it was a much sounder proposition than erecting a new works on a new site—the only alternative. The two plans show the works as they were and as they are now.

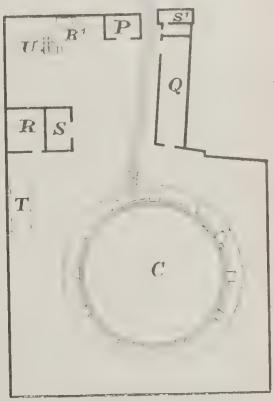


NEWARK GAS-WORKS, 1918.

The existing plant is capable of turning-out over a million c.ft. a day; three-quarters of a million of which is coal gas. The retort house is only 52 ft. wide; and with 20 ft. for the charging machine and 20 ft. for the retorts, there is left 12 ft. for the discharging side. But for a comparatively small retort house with an efficient coke handling plant, it works very satisfactorily. The retorts are 23 in. by 16 in. by 20 ft. long, with 7 in. ascension pipes each side; and the dip-pipes are fitted with Cort's anti-dips. We work with about 12½ cwt. charges in twelve hours, and charge every six hours. We get a very regular flow of gas and even quality, and arrange the retort house governor to give a level gauge in the retorts. The accompanying charts show the vacuum on the retorts and the outlet of the retort house governor, and the calorific value supplied to the town. The whole arrangement is very simple and efficient.

We obtain fairly good results. The average yield for the past twelve months was 72·3 therms, using South Yorkshire and Nottinghamshire coal. Working costs are economical. When four beds are at work, we make 140,000 c.ft. per stoker. This includes everything in connection with the retort house, clinkering furnaces, removing ashes, sweeping up, &c., and coke handling, but does not include elevating coal. One man discharges all the coal and elevates this into the overhead coal hopper. The temperatures are moderate, averaging 1300° to 1330° C. in the combustion chambers; and the charges are not very heavy. But it is hoped, working in this way, to obtain a long life from each setting of retorts. In the ordinary routine of works control, the temperatures of the combustion chambers and draughts on the settings are taken daily, with temperatures and pressures on all the plant throughout the works, sulphur compounds, oxygen content, CO_2, ammonia in clean gas, calorific value, gas engine meters, water meters, and boiler feed water tests for hardness, &c. All these are charted daily, with very little trouble; and, as "coming events cast their shadows before," trouble can often be avoided by giving the charts a few moments' consideration. Analyses of flue gases, complete gas analyses, tests of purifiers and scrubbing plant for efficiency, naphthalene tests, &c., are made whenever required.





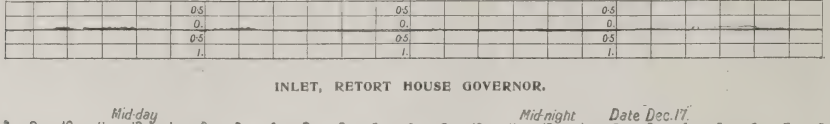
NEWARK GAS-WORKS,

Coke Handling Plant.

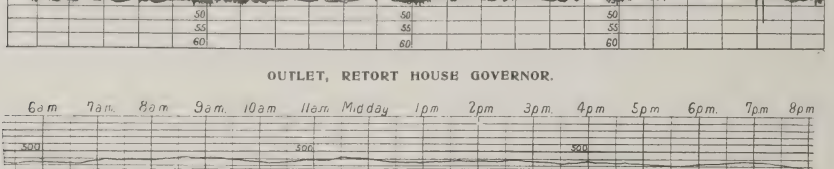
The coke handling plant is, perhaps, somewhat novel. This was made by a local engineering firm, and was constructed largely out of second-hand steel work pulled down from the old retort house. The first cost was low; and there is nothing much to wear out. The stoker on the discharging side can operate it without going outside the retort house. It consists of a bottom discharge bogey running on rails in front of the retort bench, extended up an inclined railway into a coke bunker. The bogey is pulled either way with an endless rope operated by an electric motor, which is controlled by a tramway-type controller in the retort house. The bunker is lined with 3 in. of concrete, and the hopper portion with 3-in. firebricks, to prevent corrosion.

Another travelling skip of half-a-ton capacity runs at right angles, and conveys coke out of the bunker into railway trucks on the siding, and also, if required, stores coke in the yard. The reason a steel bunker was erected instead of ferro-concrete was, as I mentioned before, that practically the whole arrangement was constructed out of old material we had on the works.

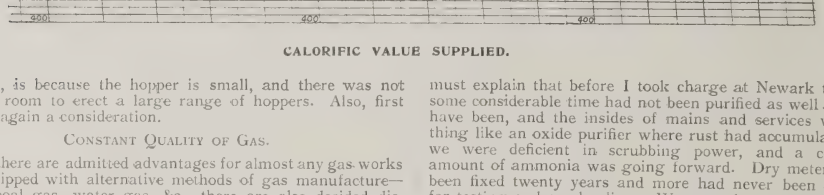
One rather unusual point about it is that the coke is screened as it leaves the hopper, and not before it is put into it. This,



INLET, RETORT HOUSE GOVERNOR.



OUTLET, RETORT HOUSE GOVERNOR.



CALORIFIC VALUE SUPPLIED.

of course, is because the hopper is small, and there was not sufficient room to erect a large range of hoppers. Also, first cost was again a consideration.

Constant Quality of Gas.

While there are admitted advantages for almost any gas-works to be equipped with alternative methods of gas manufacture—such as coal gas, water gas, &c.—there are also decided disadvantages. In the smaller works, it is very rarely an economical proposition to run two different types of plant at the same time. The best efficiency cannot be obtained out of either. It is an established fact that, to obtain the best results out of almost any plant, it should be worked to its full capacity; and, while there is an advantage in being able to control the local residual market to some extent with an auxiliary gas plant, the greatest disadvantage with modern practice is varying quality. Present-day requirements for all-round satisfactory results entail constant pressure, composition, and specific gravity. Varying quality—even only to the extent of a few B.Th.U.—means dissatisfaction on the part of the consumer.

There is a wide difference in some cases between actual loss or leakage in thousands of c.ft. and actual loss in B.Th.U. made and sold on the declared value. There is a tendency to increase pressures gradually, necessitated by increased consumption on existing mains. Probably future developments will see the gradual introduction of higher pressures to ensure that every consumer is supplied at a constant figure throughout the 24 hours, irrespective of the amount he, or any other consumer, happens to be using at any time. Unvarying composition and specific gravity are very real necessities for general satisfaction. This is, perhaps, most noticeable in industrial heating and furnace work. Smaller works that are equipped with one type of plant only for manufacturing gas are in a better position to attain this ideal; and every effort should be made to do so, not only in their own interests, but in the interests of the whole gas industry.

Experience with Low-Grade Gas.

We have gradually increased our declared calorific value from 410 B.Th.U. as we have improved our position. My experience with a low-grade gas has not been of the happiest. While a 400 B.Th.U. gas gives excellent results if the apparatus is adjusted properly, I found the cost of distributing it under modern conditions excessive. We supplied a 410 B.Th.U. gas, for the simple reason that we had no plant to provide any better. Our old retort house was in such a dilapidated condition that it was impossible to work to a higher standard consistently; and for a considerable period we manufactured a large proportion of water gas or complete gasification gas. This relieved our over-taxed purifying plant, and helped us over a difficult coal period. I also seriously considered the possibility of a complete gasification plant, eliminating the retort house altogether; and this method of manufacture was tried-out very thoroughly before deciding to proceed with further alterations to the retort bench. At that period I was optimistic enough to believe this was the future gas, and the most economical to manufacture; but under our present conditions I found it was not the cheapest to sell. As the make per ton went up, the leakage also went up in direct ratio, until we reached the alarming figure of 20 p.ct.; and there seemed to be no finality about it.

After very careful investigation, I came to the conclusion that the only sound way to get back to a normal figure was by increasing the calorific value. Our case may be abnormal, though I cannot but feel that our experiences will also apply to some extent in other places and under similar conditions. I must explain that before I took charge at Newark the gas for some considerable time had not been purified as well as it might have been, and the insides of mains and services were something like an oxide purifier where rust had accumulated. Also, we were deficient in scrubbing power, and a considerable amount of ammonia was going forward. Dry meters that had been fixed twenty years and more had never been brought in for testing and overhauling. We opened our own meter repair shop, so that careful investigation could be made of the meters; and though during the period we were supplying a 410 B.Th.U. gas we sent out for two years a pure gas—that is to say, free from sulphur, SO_2, HCN, &c.—we made no headway with our meters. We sprayed meters with a suitable gas oil, and also pumped a special paraffin into the gas, as we continue to do now for naphthalene.

The insides of the meters were pitted with tiny spots the size of a pin's head, and this on both the leathers and the casing. When the meter was first opened, these appeared like small globules of water; but after the moisture had evaporated, white spots were left on the leather and rusty spots on the tin. The leather in course of time got dry and hard, and the oil all drained to the bottom of the case. The meter began to register fast; then the leather cracked (slightly at first), and the meter gradually registered slower and slower, until ultimately it stopped. The gas seemed to contain an abnormal amount of aqueous vapour; and this, together with a fairly large quantity of ammonia (often 2 to 4 grains per 100 c.ft.), condensed on the insides of the meters. No doubt small particles of rust containing a large percentage of sulphur were also carried forward to the meters from the mains and services. The low-grade gas also appeared to have a tendency to absorb or scrub-out most of the oil from the leathers; and this left them in a state suitable for rapid decay.

It may be possible to distribute a low-grade gas successfully with dry meters, providing every trace of impurity is removed; but I think even then the gas would absorb or tend to release the oil out of the meter leathers. At any rate, since supplying a 475 B.Th.U. gas our leakage has been reduced by 7 p.ct. in two years—from 20 to 13 p.ct.—which I think is sufficient evidence that we are now on the right lines. The hydrocarbons in the richer gas protect the leathers, and the gas apparently does not tend to extract the oils out of the leathers so readily.

While there is no doubt that much of our meter trouble is in our own hands, I am equally certain that much of it is due to the makers. In the course of our investigations I visited many meter works, and the methods of preparing diaphragms vary very considerably. While some makers still follow the old-fashioned way of pickling the leathers for months, others adopt newer methods of preparing them; but the fact remains that, with us at any rate, leathers prepared in the old way are the most satisfactory.

Control of Pipes and Fittings.

The "carbon monoxide bogey" has been allowed to rest lately. In fact, Mr. Butterfield's report has finally killed it, and incidentally has done a great service to the gas industry. The summing-up of this report reflects the modern tendency of our industry's chief aim in one word, "service." Personally, I think we should take more interest in our consumers' gas affairs. Standard specifications should be drawn-up for all fittings and pipes, and every local plumber or ironmonger made to work to them under our supervision. This principle has been adopted in Newark. Some years ago we incorporated in our Act power to specify what size of pipes should be used in houses; and we now require all architects, builders, plumbers, &c., to work to our specification. We have a well-trained inspector periodically calling at every house to inquire, and

actually see for himself that everything is working satisfactorily; and I am quite convinced it is an economical scheme, as many small defects are discovered and put right which would otherwise eventually cause a consumer to be dissatisfied.

The general policy of all up-to-date gas undertakings should be service to the public, if we are to keep abreast with the times and meet competition successfully. The amount of such service will no doubt be increased more and more. It is certainly better to charge an additional 1d. or 2d. per 1000 c.ft. and give thorough satisfaction, than to sell cheaper gas and not trouble about the consumers getting good results. The average gas-fitter is, I believe, a more educated and better trained man than the type of years ago; and many undertakings make special provision for training their fitters in the theory of distribution. It is local plumbers and ironmongers who are generally to blame for unsatisfactory work. Probably one result of Mr. Butterfield's report will enable us to remedy this in the future. Competition is undoubtedly an excellent thing; but it is not in the best interest of anybody to have to compete with the cheap unsatisfactory burners and apparatus on the market, which all gas engineers know to be inefficient. If we are going to be subjected to more regulations and responsibilities, we might do well to imitate the water-works people, and have competent fitters authorized — allowing only such authorized fitters to do gasfitting.

It is placing a large responsibility on gas undertakings to maintain all fittings and apparatus in their district in first-class order; and this may have a tendency to make some consumers careless, from the knowledge that the gas company are responsible for anything that may happen, and not themselves. To carry this scheme to a logical conclusion, it should be made a finable offence if a consumer neglects to notify a gas undertaking when anything is wrong, or if he permits any outside fitter to fix apparatus that is not of approved type. Escapes are sometimes noticed for days without being reported; but I believe in some towns, if a consumer neglects to report a leaking water tap in his house, he is liable to a fine. Many gas companies encourage the police, road men, &c., to report escapes, by giving them a small reward every time a proved escape is reported.

However, the ordinary risks of gas poisoning are very small; and it is quite reasonable to assume that if everybody had an all-gas house, the annual death-rate would be reduced very considerably in this country, by the abolition to an enormous extent of fogs and smoke.

From Company to Corporation.

The Newark gas undertaking is just passing into the hands of the Corporation; and it is interesting to note how this originated. There is no central electricity generating station in Newark, though there are two or three small private companies supplying current for shop lighting. The Corporation were desirous of having their own works; and it was considered that a plant worked in conjunction with the gas-works would be the most economical to commence with, both as regards capital outlay and working costs. As it was considered in Newark that the Gas Company would have too much of a monopoly, the undertaking was offered to the Corporation; and there is no doubt that, if the latter manage the concern carefully, the transfer will benefit Newark in years to come.

While there is much to be said both for and against municipally-owned gas-works, one of the chief drawbacks of company-owned undertakings at present is that there is no really sound system of depreciation of capital, and when a company is faced with a large capital and a collection of old plant the position is serious. This is more pronounced perhaps since the war. Capital costs of plant have increased enormously; and it is conceivable that when large extensions are necessary, due to increased business, the capital costs will increase their capital ratio per million out of all proportion to what they have been used to. This they will probably have to carry for all time. There does not seem to be any probability for many years to come of obtaining the same proportion of plant out of revenue as many works have done in the past.

A municipally-owned works with a sinking fund has an advantage here. Of course, in some cases this advantage is not turned to the best account, if excess profits are used in large sums annually to relieve the rates. The determining factor in turning the scale in favour of gaseous fuel is that of cost; and it is necessary that no obstacle, whether in the form of rate subsidies or anything similar, should be allowed to oppose this policy. Having regard to the true functions of a municipality, the question of mere monetary profit should be quite secondary; and with a view to securing the universal use of gas, with its attendant benefits to the community, it should be sold at the lowest possible price consistent with protecting the ratepayers from any loss.

Electricity in Newark.

It has finally been decided in Newark to purchase electricity in bulk from the Notts and Derby Power Company. Possibly, all circumstances considered, it is the solution from an electrical engineer's point of view; but there is a much broader view —a national outlook on the whole subject. Much has been said and written about super-electrical stations, and how electricity is going to revolutionize this country; but most of these would-be reformers seem to miss the main point. It cannot be repeated too often that the chief natural resource and prime mover in this country is coal. In order to take full advantage of this, and make the best use of it, as much as possible of this coal should be carbonized; electricity being made from the bye-products, either gas or coke.

Electricity can only be viewed in this country as a bye-product of coal; any other way of regarding it is to shut one's eyes to facts. It has been amply proved that our own industry is much more efficient in its utilization of the raw material than is electricity. Of course, in countries where water power and other natural resources are available, the position is entirely different. Most small towns can generate their electricity cheaper at the gas-works, either by gas engines or waste-heat boilers; and when one considers that there is a staff and organization already in existence, it is difficult to see where the economy is in a separate undertaking.

Mr. Chaney suggested some time ago that a Gas Commission should be established to work in conjunction with the Electricity Commissioners. It appears the obvious solution. With a super-generating station equipped with extremely large units and every possible refinement in the boiler and power houses, a thermal efficiency of about 20 p.ct. is obtained in the process of generating electricity from the raw coal by way of steam; and there is no prospect of effecting any great improvement. It seems tragic that this is the best a super-power station can do; 80 p.ct. of the coal used going to waste up the chimney. Possibly in the future power production will be developed by the internal combustion engine, whose higher efficiency will displace the steam engine. Many electricians themselves admit that, unless they can generate current by water or other natural means, they have very little hope of producing much cheaper electricity.

Coal Economy.

The economical use of coal will have to be more seriously considered in this country in the future; and all the help and encouragement possible, both by legislation and otherwise, should be given to the gas industry to produce cheap gas. Low-temperature carbonization continues to make strenuous efforts to prove a commercial success. There is a low-temperature carbonization plant in operation in the Eastern Counties, combined with a complete gasification plant which is intended to replace the existing retort house. Results from this will be watched with interest. Complete gasification would, if carried out on a large enough scale and properly applied, result in an enormous saving of the nation's coal; but the elimination of the retort house, and the general distribution of a gas with comparatively low calorific value, will not come yet.

Perhaps the solution is by enriching with low-temperature gas. Mr. Evans some time ago pointed out, in one of his lectures, that, assuming there were 300 therms in a ton of coal, with modern gas-works practice 72 therms would be recovered as gas, 17 therms as tar, and 199 therms as coke, giving a total of 288 therms. With low-temperature practice 35 therms would be recovered as gas, 26 therms as tar, and 223 therms as coke, giving a total of 284 therms. It would therefore appear that the system is not so efficient at the outset as modern high-temperature carbonization. At Newark we have actually obtained 200 therms per ton of coal in the form of gas out of a complete gasification plant; a combined plant should certainly produce a larger number of therms as gas than modern gas-works practice. Even assuming the total thermal efficiency is somewhat less than present practice, if the capital costs are less and operating costs lower than with a modern retort house, it might be a paying proposition.

Strenuous efforts are constantly being made to produce cheap gas; and the modern tendency seems to favour amalgamation of the smaller concerns with the larger. It is obvious that in many cases economies can be effected and better service given to the public in this way. It is certainly a necessity to practice economy in these days; and we can only view with grave concern the general attitude of labour in this respect. If every labour organization adopted for its motto: "A square deal—a fair day's work for a fair day's pay," we should soon again be on the high road towards prosperity as a nation. The men who work are those who bear the load; and nothing but a policy of national thrift will lift the heavy debt of taxation which is oppressing commercial enterprise.

Future of the Gas Industry.

Apart from efforts to manufacture cheap gas, very real progress is being made in the efficiency of apparatus to use gas. We are having a paper this afternoon on a method of using gas for industrial purposes which claims to be a very great advance on older methods. Sir Arthur Duckham, in a paper at the World Power Conference, pointed out that for many years the low cost of labour and the apparently high cost of coal gas prevented manufacturers from considering the use of the latter, but gradually it was coming to be realized that the actual cost of fuel was not the only consideration, for so much depended upon subsidiary questions—such as transport, storage, and cost of handling and utilization. In an attempt to form a basis as to what industry could afford to pay for gas as compared with solid fuel, he pointed out that a ton of coal has a potential heat value equivalent to 290 therms. Taking the value of coal delivered to a works at 35s. per ton, the cost per therm would be 1·45d. The heating efficiency of the raw coal

fire or furnace is not, on the average, greater than 25 p.ct., whereas the heating efficiency of a gas furnace is 70 p.ct. Taking the cost of gas at 4·4d. per therm, which is the selling price of some undertakings for large quantities, the comparative figures are 5·8d. for coal and 6·28d. for gas for every therm actually utilized. Gas is, therefore, on this basis, under 8 p.ct. more costly than coal as a fuel. This is, no doubt, in many cases easily compensated for by the many advantages attached to the use of gas.

Possibly very large developments in the further use of gas in industry are not far distant; and it only goes to show the growing importance of every undertaking of any size concentrating on the distribution of gas and organizing an efficient distribution department. I feel confident, as every other gas engineer, that the gas industry has a very great future before it. It is quite possible that it will develop into the premier industry in this country, as coal is our greatest national asset, and at present we are showing the nation how to use it in the most economical manner. When it is remembered that there are over 16 million gas cookers and fires in use in this country, and that the Gas Light and Coke Company alone produce in a year approximately as much energy for light, heat, and power as is produced in the form of electricity by the whole of the electrical undertakings in Great Britain, there is no need for the suggestion that gas is on the wane.

Publicity.

I am afraid there is still a great tendency for us, as an industry, to "hide our light under a bushel." We do not shout enough, but are content to go quietly along, letting our goods advertise themselves. Imagine how the "Daily Mail" would advertise the fact if they had a circulation of 16 million copies, or supplied as much printed matter as all the other daily papers in London put together. Too much is left to the "B.C.G.A." Many undertakings are content to pay their annual subscription, and let their publicity work stop there. If every gas undertaking advertised intelligently in the local papers, the "B.C.G.A." could devote more time and energy to telling the country what the gas industry is doing for the nation. We know the usefulness and national importance of our work; but the very fact that we have been in existence over a hundred years is sufficient to lead people to believe that we have had our day, and that it is only a matter of time for the newer arrival to supplant us. Many who consider themselves well informed say as much, and we shall have ourselves to thank if that theory grows.

I am sure that, if the electrical industry in this country could do as much for the conservation of coal and the abolition of the smoke nuisance, the whole country would never be allowed to forget the fact. It would appear that we as an industry are not sufficiently assertive; and probably the majority of us still have a feeling at the back of our minds that advertising is a little *infra dig*. We compromise by producing something very nice and quiet and artistic, and console ourselves by saying that, after all, it does not matter very much—gas advertises itself. Gentlemen, it is a mistake. The time has arrived to let the country know what are our capabilities, and in no uncertain manner. If the business world knew as much about us as we know ourselves, there would be a general demand to gasify the country instead of electrifying it; and it behoves us therefore to educate politicians.

Political influence is responsible largely for the present state of affairs; and it seems a remarkable thing that gentlemen with no real knowledge of the subject should be in a position to force the country into a policy which will eventually mean an expenditure of many millions, with no corresponding advantage. There has been of late a strong tendency among politicians to boost electricity at all costs; and I believe that much of that tendency has been caused through lack of knowledge. There is a large field for both gas and electricity, in which both can work for economy, efficiency, and the improvement of the atmosphere of our towns. Anything that will assist in bringing more sunshine into our lives should be welcomed and encouraged, not for our own sakes, but for the future health, wealth, and prosperity of the nation. The sooner this fact is realized, and coal is viewed as stored sunlight, the happier and better will it be for future generations.

"B.C.G.A." South-Western District Conference.—Arrangements have been made for a British Commercial Gas Association South-Western District Conference to be held in the Plume of Feathers Hotel, Minehead, on Friday, May 8, under the presidency of Mr. J. H. Ellis, President of the "B.C.G.A.," and Chairman of the Plymouth and Stonehouse Gas Light and Coke Company. In the morning Mr. John Burgess, J.P. (the Chairman of the Minehead Gas Light and Coke Company, Ltd.), will welcome the visitors, and Mr. Edwin P. Vince (the Company's Manager and Secretary) will read a paper entitled "Local Publicity and Service Methods of a Fifty Million Works." Luncheon will be followed by a public conference in Newcombe's Café, The Parade, when an address on "The Modern Labour-Saving House" will be given by Mrs. Robert Noble (Consultant on Home Hygiene, Furnishing, and Equipment).

CONSTITUTION OF COAL.

At a meeting of the London Section of the Society of Chemical Industry, held at the Royal Society of Arts, Adelphi, on Monday evening, April 6, Prof. W. A. Bone lectured on the subject of "The Constitution of Coal"—indicating some of the lines of inquiry into the matter which have hitherto been pursued, and offering some suggestions with regard to future investigations.

At the outset, he informed his audience that he was not going to tell them what is the constitution of coal, for the simple reason that he did not know. Of late years there has been a great deal of research on the subject of coal—certainly it has not been in want of investigators or of money to urge it forward. Yet, if one took a candid view of the situation, one would conclude that not much of fundamental importance is being found out about the chemical constitution of coal. Very little more is known of this matter to-day than was the case twenty years ago. For the fact that present research is not making such progress as might be wished, he did not think that the researchers were to be blamed; but he suggested that the time has arrived when the organic chemist must take up the matter. The fact must never be lost sight of that, coal being an organic substance, its constitution can only be finally determined by methods adopted with other organic substances. He explained that in this country there does not exist a very wide range of coals, and put forward the view that the subject has suffered from the fact that many of the investigators have only been considering coal as it is known and used here. They should not limit themselves to bituminous coals. In other countries there are many varieties of less matured coals; and these also must be considered in order to arrive at a satisfactory explanation of the chemical constitution of coal.

At one point in his lecture, Prof. Bone said he thought it had been suggested that the cause of the coking properties of coal resides in the vitrain; but personally he did not believe this, and he had the best of reasons for not believing it. He directed attention to samples of coal which, though they may contain considerable quantities of the jet-like substance called vitrain, will not coke at all. It may be, he added, that there is a connection in the case of some of the bituminous coals, but he doubted it. One must look elsewhere for the cause of the coking properties of coal.

Showing by the aid of lantern slides results which have been secured by him, Prof. Bone explained that he does not like the use of pyridine as a coal solvent, so he has ceased to employ it for the purpose. He prefers in its place to use benzene under very high pressure. There is no gas evolved during the benzene extraction in the case of bituminous coals. There may be some slight change in the coal substance, but it does not involve any breaking-down of the coal structure itself. The crude extract is obtained in this way, and then fractionated in a manner which he described.

Some discussion followed the lecture—or "conversation," as Prof. Bone preferred to term it. Dr. Lessing remarked that, the further one went into coal research, the greater seemed to be the field of ignorance one met with. It would be only by the combined work of a great many investigators that they would eventually be able to see a little more clearly. Prof. Bone had rightly laid stress on the fact that the organic chemist must take a part in this research. Without paying considerable attention to the question of coal formation, it would be impossible to get nearer the subject of constitution, because the two were closely linked together. He (Dr. Lessing) was responsible for attributing the coking properties of coal to the clarain and vitrain portion. There was no difference in fact between Prof. Bone and himself; for the component in younger coals from which clarain and vitrain were formed was non-coking. Moreover, the material into which these components changed on further maturing, say into anthracite, was also devoid of coking properties. Dr. Scholtz expressed the opinion that the substitution of benzene for pyridine was a very important step. Dr. Harold G. Colman said much good work had been done, and made reference to the products resulting from the extraction with benzene, which he agreed was a great improvement on extraction with pyridine; but he thought that some decomposition of the coal must have taken place under the conditions of the experiment. Prof. Bone, in reply, said he adopted benzene as being the least objectionable substance for the purpose.

"An Introduction to Technical Drawing."—This is the title of a work by W. Abbott, B.Sc., which is to be published by Messrs. Blackie & Son, Ltd., No. 50, Old Bailey, E.C. 4, in three parts at 2s. 6d. net each. The publication is designed to meet secondary and central school requirements; ample work having been included in the three parts to cover a three years' course. After completing the course, students will be in a position to begin specialized work in one or more branches of technical drawing—machine design and construction, building construction, &c. The author has included a good deal of plane and solid geometry in the course. We have received a copy of Part I., and feel sure that it will prove exceedingly useful.

SAFEGUARDING OF GAS ENGINES.

A great deal of practical information was contained in a paper which Mr. G. Stevenson Taylor, O.B.E., A.R.C.Sc., A.M.I.Mech.E. (H.M. Senior Engineering Inspector of Factories), read at the last meeting—held at St. Bride's Institute, E.C.—of the Institution of Engineers-in-Charge.

The subject of the paper (which was illustrated by a series of lantern slides) was "The Safeguarding of Prime Movers and Transmission Machinery;" and, of course, a good deal of consideration was given to the proper fencing-off or covering-in of the moving parts of gas and oil engines. The author pointed out that the requirement as to fencing of every part of a water wheel or engine and every flywheel is absolute, though it may be so situated that no danger or liability to accident is likely to ensue from its position. Similarly it has been held that the bevel gearing of an engine governor must be securely fenced, though the engine itself was fenced. Again, all machinery from which, in the ordinary course of working, danger may reasonably be anticipated—though such danger may arise by reason only of careless working or of external causes—must be securely fenced. Upon the occupier of every factory rests the responsibility of ensuring that his machinery is securely fenced; but exactly what may be regarded as secure fencing for a particular engine or part of machinery will depend to some extent on local circumstances and the knowledge and experience of the person concerned.

Considering more particularly the safeguarding of the parts of prime movers and transmission machinery, the following are regarded as the essentials of a satisfactory safeguard:

(1) It should prevent access to the dangerous part so long as the danger exists.
(2) It should be constructed of such materials, and in such a manner, as to withstand the wear and tear to which it is likely to be subjected.
(3) Wherever practicable, it should form an integral part of the engine or machinery, and have been considered in its design.
(4) Its removal should not be necessary for the purpose of lubricating any part of the engine or machinery, or for changing belts, gears, &c.

The selection of a suitable material for the construction of safeguards is a matter of the utmost importance, but unfortunately often receives very scant attention. When substantially and firmly constructed of sound timber, wooden guards for such parts of machinery as pullevs, belts, small flywheels, and shafting can be both neat and effective. However, the use of wood for guards has several disadvantages. It is easily splintered or broken, and thus unsuitable for rough usage; it readily absorbs liquids, and is therefore unsuitable for positions where it may be splashed with oil, &c.; and it increases the fire risk. Cast iron is a particularly suitable material for the safeguarding of many dangerous parts of engines. Guards of this material can be designed so as to form an integral part of the engine, and to meet all other conditions. Sheet metal, of suitable gauge, is an excellent material for guards—especially for those required on existing machinery, though there is no difficulty in making provision for such guards in the design of a machine. A sheet-metal guard should be supported on a strong framework of angle bar or rod, and it should be made by skilled workmen. Rods, tubes, and bars of metal are suitable for some classes of safeguards, particularly those which are effective at a distance of about 18 in. from the part of machinery to be guarded. Unless this is the case, these materials should not be used, except with small spacing, or in conjunction with sheet metal, wire work, or expanded metal. Wire work and expanded metal are similar materials for guard construction, except that expanded metal often has a somewhat sharp edge, which may cause cuts. Much may be said in favour of these materials if they are used of suitable gauge and mesh, and properly secured to strong framework. Millboard, *papier mâché*, and similar materials, have mainly been used in the construction of some patented types of safeguards for revolving shafting. Where, as on overhead shafting, they are not subjected to rough usage, such safeguards have proved effective, and have lasted for some time.

Dealing with individual safeguards, Mr. Taylor said it is very desirable that, wherever practicable, an engine should be installed in an engine house. The side of such a house often constitutes part of the fencing for a flywheel or other moving part of the engine. The use of wood for the fencing of engines is not recommended, for reasons already stated, and also because it is likely to be of inadequate strength. Flywheels—and particularly those on large gas engines—are frequently found with excellent fencing on the outside, but on the side near the crank a single rail placed 6 or 7 in. from the flywheel has been regarded as sufficient, though the attendant has to approach this side at intervals in order to feel the bearing. In all such cases additional guards of sheet metal or wire mesh extending just beyond the crank shaft bearing are necessary. A number of horizontal gas and oil engines are now supplied by the makers with the cranks, and in some cases the connecting rods, enclosed in sheet-metal casings. This system has also been adopted by some makers for these parts on large horizontal steam engines. Many high-speed vertical steam engines have the crank chambers completely enclosed; and with the exception of the flywheel and governor there are no exposed moving parts on these engines. The same is true of many large vertical gas and oil engines.

On steam, gas, and oil engines, where the valves are operated by means of a separate valve, cam, or lay shaft, this is usually driven from the crankshaft by means of bevel, skew, or worm gears. These gears should be guarded by means of sheet or cast-metal casings; and such casings are generally fitted by the engine makers. A certain number of accidents have occurred on the cam shafts of gas and oil engines, though many engine makers and users appear to be unaware of this danger. These shafts are usually carried fairly close to the engine framing, and are best fenced either by means of a sheet-metal apron guard attached to the framing or by enclosure in a metal casing. On vertical gas and oil engines—including Diesel engines—the vertical or inclined shaft transmitting motion from the main engine to the cam shaft should be encased. This is done by several engine makers.

Many of the fatal accidents in connection with engines are due to the bursting of flywheels caused by failures of governors. Some of these arise from faulty design, and others from wear or slackness. The maintenance of the governor and governor gear in proper working order is therefore a matter of primary importance. Wherever possible, some trip device, speed control, or stop motion should be fitted, in order to prevent racing of the engine in the event of the governor failing. It is not uncommon to find engines with a length of the main shaft projecting beyond the flywheel, or even beyond the outer flywheel bearing. Such shafting should, of course, always be fenced; and this is best done by means of a tube or sleeve. Any other accessible parts of the main shaft should be guarded in a similar manner, or by means of suitable rail fencing.

Air-Driven Wire Brushes for Holder Cleaning.

A short time ago, the People's Gas Light and Coke Company, of Chicago, were confronted with the problem of how best to clean the outer surface of one of their 5 million c.ft. holders. Describing the method adopted, the "Compressed Air Magazine" states that the holder had not been painted for more than two years, and had reached a state which called for prompt and radical attention. The two bottom lifts were in a particularly bad way. In consequence of the action of the water and the air, the paint had become blistered, and much of the metal was covered with a thick coating of rust. The three upper lifts were not so much in need of attention, and could be made ready for re-painting with comparatively little work. Therefore the cleaning of these lifts was accomplished by hand. The two bottom lifts were cleaned with air-operated wire brushes; the air for the purpose being furnished by a portable compressor. The wire brushes did their work well; and the foreman in charge declared that it would not have been possible to do it satisfactorily by hand. The metal between the rivets was deeply corroded; but the high speed of the pneumatic wire brushes enabled them to get between the rivets and clear away the rust and scale preparatory to painting. Furthermore, the mechanical brushes saved a great deal of time, and lightened the work of the men.

Gas Used in Producing Shell Flakes.—A Monterey (California) inventor has, says the "American Gas Journal," perfected a method for converting abalone shells into beautiful flakes for stucco work. Each year abalone produces a layer of new shell. The inventor treats the shell chemically, and then places it in a special gas-heated stove, where it is permitted to remain for a certain length of time, which results in the disintegration of the various layers of shell. After this the shell is run through a grinder, which flakes it, producing a Roman gold effect that is permanent. In applying the flakes for stucco work, the walls are plastered, and then the flakes are pushed by hand or compressed air into the wet stucco.

The Late Mr. H. E. Jones.—The April issue of the "Wandgas Magazine"—the Journal of the Wandsworth, Wimbledon, and Epsom District Gas Company—contains affectionate references to the late Chairman by the Chief Engineer and the Secretary. Mr. C. M. Croft says of Mr. Jones: "Always proud of his profession, in which he obtained the highest honour; always busy, but never too busy to help another, he leaves this world the better for his long life, spent in untiring service for the public good—the ideal of every true gentleman. The loss to us is irreparable; but his memory will be a lasting pleasure, and his life an example and ideal for us all." Mr. C. W. Braine says: "There was nothing of unctuous piety about him, and he did not wear his heart on his sleeve. He was intensely human. His friend, the Rev. Hugh Chapman, well expressed his attitude towards religion in his address at the memorial service in London, and spoke of a quality of justice, coupled with good fellowship. These were not mere words."

THE HYDROGENATION AND LIQUEFACTION OF COAL.

Two years ago H. G. Shatwell and J. Ivon Graham commenced a series of investigations on this subject; and the results of their work have been published in "Fuel in Science and Practice." Concerning the hydrogenation of coal, Bergius has drawn what appears to the authors to be a somewhat artificial line of demarcation between coals containing less than 85 p.ct. of carbon (ash-free basis) and those containing more than this amount. The former he considers may be readily converted into a thick oil under certain experimental conditions, leaving nothing but the ash; while of the latter only a certain proportion is liquefied. As it seemed possible that the coals of less than 85 p.ct. carbon content used by Bergius were lignitic in character, while those of over 85 p.ct. resembled steam coals of high carbon content, the authors considered that the treatment of a highly oxygenated non-coking bituminous coal would be of special interest, in view of the desirability of finding for such coals an industrial application apart from their use as a fuel for household purposes. It was decided to test the action of hydrogen at high pressures (100 atmospheres and over) and at a temperature in the neighbourhood of 400° C., on the microscopic ingredients. A series of several experiments showed that hydrogenation of clarain in the dry state was unsuccessful from the point of view of oil formation. In subsequent experiments a liquid medium—phenol, except in one instance—was employed, in which clarain, durain, and fusain were treated.

Hydrogenation with Gas Oil as Medium.

In the first experiment, 150 grammes of coal and 400 c.c. of a gas oil were heated with hydrogen during 4 hours to a maximum temperature of 415° C. and a maximum pressure of 110 atmospheres. After cooling, the residual gas was released, and treatment continued with fresh hydrogen during 3·5 hours. The product was partly solid and partly liquid. Approximately 40 p.ct. of the coal was converted into liquid.

Hydrogenation with Phenol as Medium.

Clarain hydrogenated in the presence of phenol during 3 hours at 416° C. and 123 atmospheres caused absorption of hydrogen of over 2 p.ct. The recovered material was 56·2 p.ct. soluble in phenol and 20 p.ct. insoluble; there being a loss of 23·8 p.ct. The soluble portion yielded 53 p.ct. to chloroform with 47 p.ct. insoluble, each portion being a brown solid, but that soluble in chloroform having a low melting point. The chloroform-soluble powder contained about 7 p.ct. of hydrogen. This product represented 29·6 p.ct. on the original clarain. Hydrogenated in the presence of phenol for 13 hours, clarain gave 37·7 p.ct. of oil soluble in ether. Heated in the presence of phenol in an atmosphere of nitrogen, clarain gave a yield of 8·3 p.ct. of material soluble in phenol.

Durain was hydrogenated in the presence of phenol during four days, a fresh supply of hydrogen being admitted at the beginning of each day's run. It was found that 4·49 p.ct. of hydrogen had been absorbed. The product consisted of 37·5 p.ct. insoluble residue, 7·5 p.ct. of a brown powder soluble in phenol, but insoluble in ether, and 37·5 p.ct. of an oil soluble in ether; there being a loss of 17·2 p.ct.

Fusain.—The fusain was a soft variety of high carbon content obtained from the No. 2 Rhondda seam, South Wales. Hydrogenated under the same conditions as employed with durain, very little change took place, there being recovered 95 p.ct. of an insoluble residue which appeared to be but little altered.

Hydrogenation of a Coal of High Carbon Content.—This sample from the Graigola seam, South Wales, had the following ultimate analysis: Carbon, 91·54; hydrogen, 4·32; sulphur, 0·84; nitrogen, 1·45; and oxygen, 1·85 p.ct. Hydrogenated in the presence of phenol during 9 hours at a maximum temperature of 430° C. and a maximum pressure of 137 atmospheres (average about 130), 55·4 p.ct. was found to be soluble in phenol, of which 47 p.ct. was soluble in ether—*i.e.*, 26 p.ct. on the original coal (on an ash-free dry basis). Heated at ordinary pressures to 600° C., this coal gave only 2 p.ct. of tar oil and water, very slight decomposition taking place up to 420° C.

General Conclusions.

(1) The possibility of hydrogenating coal under high pressures and at temperatures between 400° and 436° C. has been definitely confirmed, and substantial yields of liquid products have been obtained.

(2) The nature of the liquids so prepared has not been elucidated. They appear to contain oxygen; and it will be a problem for future investigation to determine if this oxygen is eliminated by further hydrogenation, and hydrocarbons thereby obtained.

(3) The statement by Bergius that coal containing more than 85 p.ct. of carbon is difficult to liquefy is refuted. South Wales coal appeared to be hydrogenated almost as readily as South Staffordshire coals, whereas the fusain experimented with was relatively inert.

(4) The nature of the action of phenol or a mineral oil in accelerating liquefaction is not clear. It was thought that the liquid medium might exert a solvent action on the coal, and that hydrogenation of the coal material in solution would then proceed readily. Experiments, however, prove that this view, as regards the clarain used, is untenable, while the work of Illingworth suggests that it is equally invalid with the coal from the Graigola seam. In the light of some of the results, it seems probable that hydrogenation of coal can take place in the absence of a liquid medium, but that the viscous liquids produced cover the surface of the coal particles and prevent further access of hydrogen. The presence of a solvent will remove the hydrogenated product, thus leaving a new surface exposed to the action of the hydrogen.

(5) It is significant that the yields of products soluble in phenol from the clarain and durain are approximately the same, and that the liquids obtained give almost identical analytical figures. This would appear to be further evidence in support of the view put forward by Tideswell and Wheeler that the clarain and durain from the same coal contain constituents of similar chemical type.

(6) The heavy losses experienced in the treatment of the clarain and durain (both containing substantial proportions of oxygen) are due to excessive gas formation, the production of water, and probably also to the formation of phenols, which were removed in the subsequent technique.

SMOKELESS FUEL AND OIL.

A Meeting of the Manchester Section of the Society of Chemical Industry was held at the Textile Institute, Manchester, on Friday, April 3—Dr. H. Levinstein presiding. A paper entitled "Smokeless Fuel and Oil" was read by Dr. C. H. Lander, Director of Fuel Research in the Department of Scientific and Industrial Research.

The lecturer said that, in 1890, the late Mr. Scott-Moncrieff proposed to carbonize coal, or to make a fuel which he hoped would be a better fuel than gas coke, by withdrawing gas coke from the retorts before it was properly carbonized. This was the germ of the low-temperature carbonization process. It was not, however, until 1906, when the late Mr. Thomas Parker, of Birmingham, took out a patent for Coalite, that the subject received special attention. In 1912 the advantages of such a process were realized from a different angle. The Rt. Hon. Winston Churchill, who was then at the Admiralty, appointed a Committee, under the late Lord Fisher, to go into the question of fuel for the engines of the Navy. At that time there was a possibility of Diesel engines being used in the Navy. That Committee went very carefully into the question of the possibility of providing a home supply of fuel oil. There were no known natural oil supplies in this country capable of serious commercial exploitation. The Scottish shale oil industry survived with difficulty; and both the quantity and the quality of its output were gradually diminishing. The large shale deposits of Norfolk and Kimmeridge, though fairly rich, were not suggested as a possible source of oil supply for this country. The Commission were therefore brought back to the consideration of coal. Two distinct industries were concerned with the carbonization of coal—the metallurgical coke industry and the gas industry. After considering the possibilities, the Commission rather negatived the idea of further supplies of oil being obtained from these two industries in the form in which they existed. Of course, any new industry would probably knit itself on to the two older ones. In 1913, the Commission reported that the most hopeful method of obtaining adequate supplies of fuel oil for the Navy and Mercantile Marine during peace-time, and to a certain extent in war-time, lay in following up the suggestions of Parker for the production of Coalite. Large quantities of oil could then be obtained, by ordinary carbonization methods, together with some gas. There were 35 to 40 million tons of coal per annum burned in the domestic grates of this country, with enormous waste from both the thermal and the chemical points of view. The more valuable of the constituents of the coal simply went up the chimney, polluting the atmosphere, and causing great damage. If this enormous amount of coal could be diverted through some carbonization process in such a manner as to produce the maximum amount of oil, the minimum amount of gas, and a good smokeless fuel, great advantage would result. Dr. Lander then explained the work done at H.M. Fuel Research Station at East Greenwich.

At the conclusion of his paper, the lecturer referred to the Bergius process. A great deal of interest was being taken in this matter; and the plant was extremely interesting. As a matter of fact, the Bergius Company were seeking for a cheaper raw material than oil. Some people said that the so-called hydrogenation of oil was simply pressure-cracking. There was, indeed, a controversy as to whether it really was hydrogenation. The whole problem was being carefully investigated in Germany.

Mr. A. F. Browne, whose death occurred recently, at the age of 74, left estate of the gross value of £7712, with net personalty £7571.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

On Friday last, April 17, members of the Association met the Westminster Technical Institute, Vincent Square, W. 1, to hear and discuss a paper on "Fuel in Industry" by Mr. Dean Chandler, who is in charge of the Industrial Furnace Laboratories of the South Metropolitan Gas Company. The paper was accompanied by an index of articles on the industrial uses of gas which have appeared from time to time in the Journal," and also by a series of interesting photographs of gas furnaces. It has not been possible to publish all these illustrations; but a good selection is reproduced.

Mr. W. Newton Booth, who occupied the chair, in introducing Mr. Chandler, emphasized the importance of the use of own gas as an industrial fuel.

FUEL IN INDUSTRY.

By Dean Chandler, of the South Metropolitan Gas Company.

[Extracted.]

The problem to-day is to determine the best and most economical methods of using our coal. Briefly, there are four methods at our disposal:

1. It may be consumed in the raw state in domestic grates and industrial furnaces.
2. It may be wholly converted into gas in suitable producers, as originally proposed by Mond.
3. It may be burnt in pulverized form.
4. It may be subjected to processes of distillation, known as carbonization.

It is generally conceded that (1) is extremely wasteful and often inimical to health. Cases in London have come to my notice where 5 therms have been used in the form of raw coal to do the work which has subsequently been accomplished by 1 therm by means of town gas. Alternatives (2) and (3) are for certain large-scale operations justified, providing the right class of coal is employed for the purpose. Alternative (4) is, however, the rational method of treating bituminous coal—namely, to subject it to a heat-treatment process by which it is possible to recover all those valuable distillates which are otherwise lost when raw coal is burnt. At present only about 30 million tons in the United Kingdom are so treated—10½ million tons at gas-works and 13½ million tons by coke-oven plants.

Unfortunately for the electrical industry, the generation of electric energy must be classed under (1), since the general practice to-day is to burn raw coal for this purpose. This common

TYRE HEATING FURNACE.

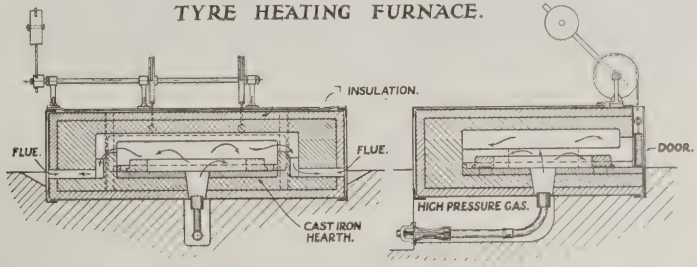


FIG. 1.

FIG. 2.—TYRE HEATING FURNACE, L.C.C. TRAMWAY DEPARTMENT.

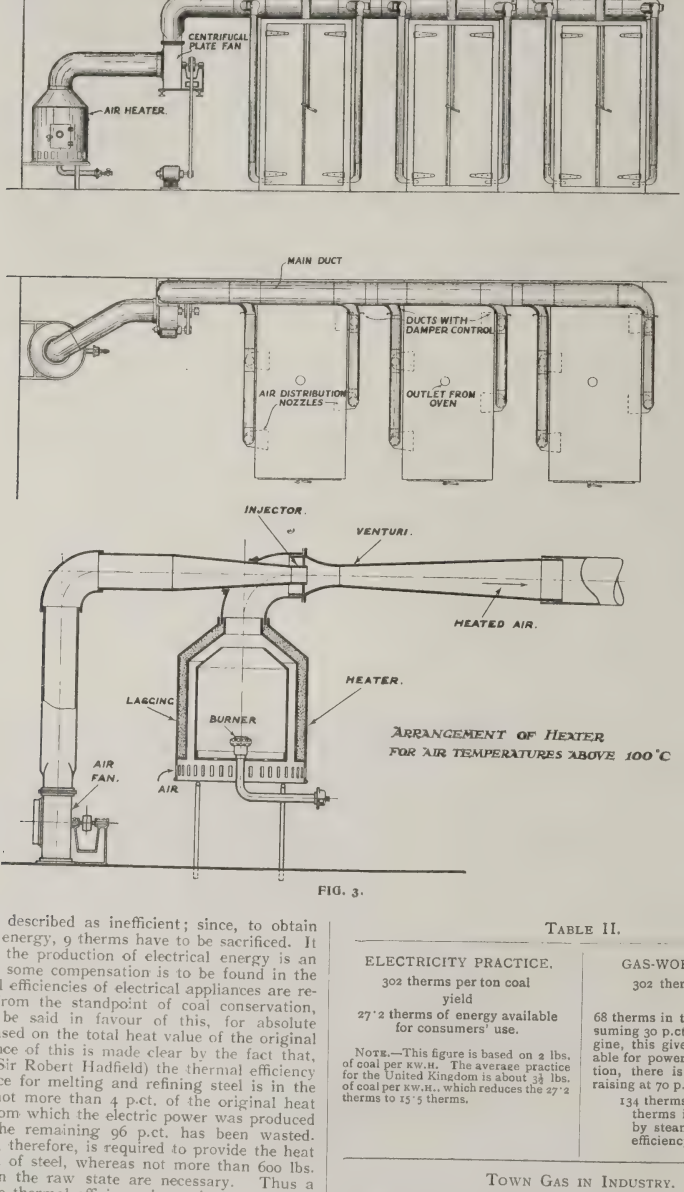


FIG. 3.

method can only be described as inefficient; since, to obtain a therm of electrical energy, 9 therms have to be sacrificed. It is said that, though the production of electrical energy is an extravagant process, some compensation is to be found in the fact that the thermal efficiencies of electrical appliances are remarkably high. From the standpoint of coal conservation, however, little can be said in favour of this, for absolute efficiency must be based on the total heat value of the original coal. The significance of this is made clear by the fact that, while (according to Sir Robert Hadfield) the thermal efficiency of the electric furnace for melting and refining steel is in the region of 47 p.ct., not more than 4 p.ct. of the original heat energy of the coal from which the electric power was produced is actually used. The remaining 96 p.ct. has been wasted. Nearly 1 ton of coal, therefore, is required to provide the heat energy to melt 1 ton of steel, whereas not more than 600 lbs. of coal when used in the raw state are necessary. Thus a much higher absolute thermal efficiency is attainable by burning raw coal.

A comparison of the fuel required for heating 1 ton of steel to 900° C. by coal gas and electricity is given in Table I.

TABLE I.—*Comparison for Heating 1 Ton of Steel to 900° C.*

Fuel.	Therms Used.	Efficiency. P.Ct.	Pounds of Coal Used at Station per Ton Steel Treated.
Coal gas	17·9	32·0	560 lbs.* (used at gas-works)
Electricity	10·3	54·0	851 lbs. (used at electricity works)

NOTE.—* 560 lbs. at gas-works yields 280 lbs. of coke for sale, equal to 33·4 therms. Assuming that coke fired furnaces are only half as efficient as gas-fired furnaces, then a further 0·93 ton of steel could be heated, making a total of 1·93 tons for the expenditure of 560 lbs. coal at the gas-works, then $\frac{560}{1·93}$ gves 290 lbs. per ton used in the gas works. In addition, chemical products are recovered.

TABLE II.

ELECTRICITY PRACTICE.	GAS-WORKS PRACTICE.
302 therms per ton coal	302 therms per ton coal
yield	yield
27·2 therms of energy available for consumers' use.	68 therms in the form of gas. Assuming 30 p.ct. efficiency of gas engine, this gives 20·4 therms available for power purposes. In addition, there is available for steam raising at 70 p.ct. boiler efficiency:
NOTE.—This figure is based on 2 lbs. of coal per KW.H. The average practice for the United Kingdom is about 3¼ lbs. of coal per KW.H., which reduces the 27·2 therms to 15·5 therms.	134 therms in coke, giving 93 8 therms in steam, which give by steam engine at 20 p.ct. efficiency 18·8 therms.

TOWN GAS IN INDUSTRY.

The fuel *par excellence* for industrial heating is gaseous, and there can be little doubt that energy in this form is destined increasingly to supersede solid fuel for a large number of purposes, because of its cleanliness, convenience, constancy of supply, and uniform quality. The use of town gas in all branches of engineering and industrial activity was largely a war-time development, and resulted from the demand for a considerable increase in output of materials of every description. It was thought in some quarters that the industrial load which had been built-up during the war would, after the Armistice, decline and be finally lost; but the advantages of the use of gas as a fuel for a hundred-and-one purposes had been conclusively demonstrated, and its future was thereby assured. Of course, it was to be expected that a sudden drop in the load would occur immediately after the cessation of fighting; but with the return of more normal conditions in industry, the temporary set-back has gradually been made good.

Ten years' experience has taught that one of the essentials for the successful advocacy of gas for industrial purposes is that this branch of business must be handled by men who possess

FIG. 4.—Gas-fired plant for heating air used in drying painted and varnished tinned plates. The heating ovens have a total capacity of 3000 c.ft. A volume of about 120,000 c.ft. of air is raised to about 200° Fahr. per hour; and this maintains a temperature of about 160° Fahr. in the ovens. The maximum consumption of the plant is about 3·7 therms per hour.

more than the ordinary qualifications of salesmen. This is a specialist's business, and it is hopeless to expect a healthy and progressive development if it is left in the hands of those who have but a hazy idea of the basic principles upon which the efficient use of gas as a fuel depends. There must be a common ground of understanding upon which the gas salesman and the works technologist can meet, in order that all the facts with regard to any particular problem may be properly correlated. This is only possible when the representative of a gas company possesses the requisite knowledge. A clear understanding of the basic principles of combustion and of scientific furnace control is essential. The physical and chemical properties of the various grades of fuel should be known; and such information should always be ready to hand. But in addition to an all-round technical knowledge of matters relating to fuels and their combustion, some knowledge of metallurgy and of the more common industrial processes is an invaluable asset, and may be acquired by a study of some of the hundred-and-one books at everyone's disposal to-day.

A matter of vital importance is co-ordination of effort on the part of the commercial and technical staffs. Success very largely depends upon goodwill between the commercial representative and the practical men who should be engaged in the business. The practical technician has always to remember that the man who is canvassing for gas as a fuel has, in the long run, to depend for success upon the gas-consuming appliances which are at his disposal. The real crux of the problem so far as the use of gas as a fuel is concerned is cost. At a time when manufacturers were pressed by the urgency of war, fuel costs became a secondary matter—the problem was simply a question of output. To-day, however, industry is on a strictly competitive basis, and fuel cost is of vital importance, and a question of greatest concern to gas furnace designers. It is incumbent upon the gas furnace and appliance engineer to give the strictest attention to such matters as the combustion efficiencies of the various methods of burning gas and the relative merits of the alternative systems available, the judicious selection of which when applied to a particular process may have a considerable bearing on fuel cost. One of the chief factors requiring consideration in what might be called scientific furnace design is the proportion of air to combustible gas. The fuel losses due to excess air may be considerable. Much can be done to effect a substantial economy by detailed attention to this important matter. It is surprising the extent to which heat energy is dissipated from the average gas fuel furnace. There is, however, no reason for a continuance of this state of affairs. There are many excellent insulating materials at our disposal, the use of which will go far to reduce the consumption of fuel. I have seen gas-fired furnaces concerning which one might be pardoned for assuming that they had been constructed for the purpose of performing the function of a domestic gas radiator, so effective were they in warming the room. As a resuk of tests carried out on lagged and unlagged muffle furnaces, it was found that, after the gas had been turned off for a period of eight hours, the temperature inside the muffle with lagging was 480° C., inside that without lagging only 250° C.

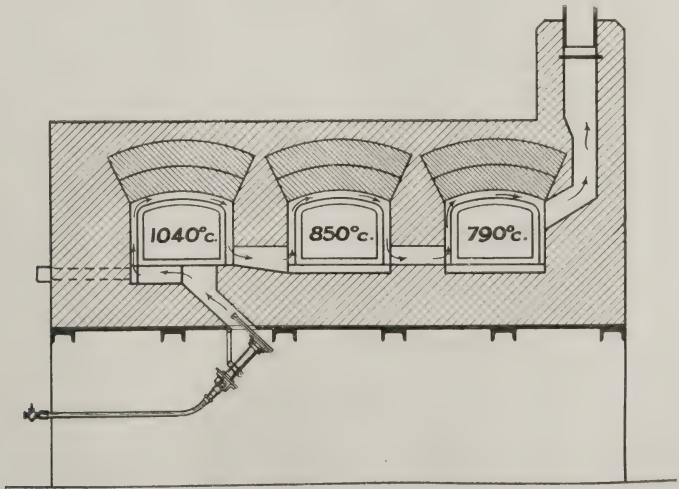


FIG. 5.

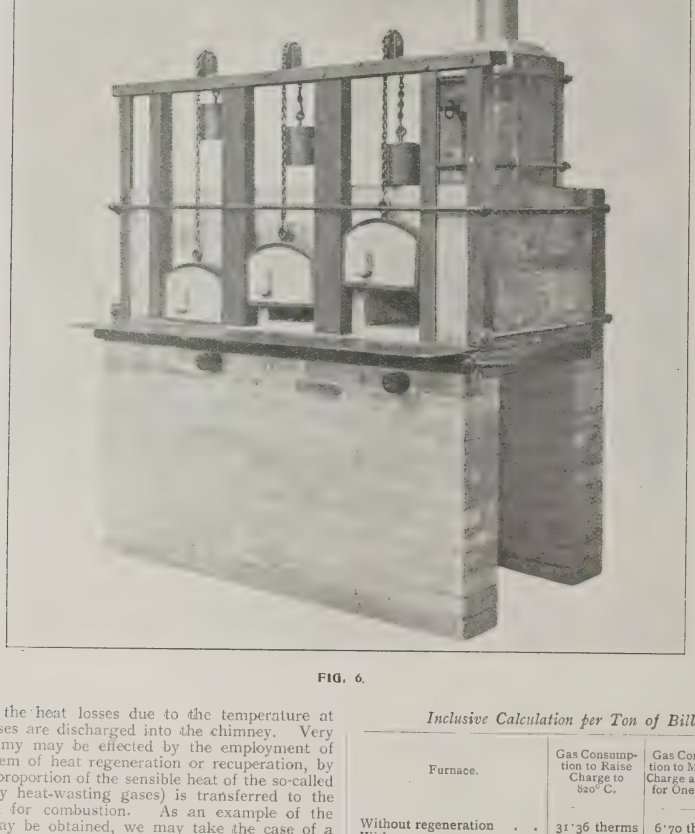


FIG. 6.

Then there are the heat losses due to the temperature at which the flue gases are discharged into the chimney. Very considerable economy may be effected by the employment of some suitable system of heat regeneration or recuperation, by means of which a proportion of the sensible heat of the so-called waste gases (really heat-wasting gases) is transferred to the air which is used for combustion. As an example of the economy which may be obtained, we may take the case of a furnace in which the air entering in sufficient quantity to effect complete combustion of the gas is raised in temperature to 1000° C. It will then have had imparted to it about 35 p.ct. of the total heat units of combustion of the gas. The value of recuperation in practice may be illustrated by the following data, which relate to a specially designed gas-fired muffle furnace for firing vitreous enamelled goods:

Inside dimensions of muffle . .	63 in. by 30 in. by 21 in.
Temperature of air leaving recuperator and entering combustion chamber	350° C.
Temperature of flue gases leaving recuperator	375° C.
Approximate gas consumption to maintain a working temperature of 950° C.	3·65 therms per hour.

A similar furnace in every respect, but without recuperator, required approximately 20 p.ct. more gas.

A striking example of the value of the application of the Siemens principle of regeneration to a gas-fired furnace designed for the heat treatment of steel billets is the following: The furnace was a "Revergen" open-hearth oven, 4 ft. 6 in. by 3 ft. by 2 ft., and the test required that the oven should be brought to a predetermined temperature (820° C.) and loaded-up with cold billets; the whole being then brought back to the same temperature and being so maintained for one hour. The following results were obtained:

Gas consumption per ton of billets to raise charge to 820° C.	16·3 therms.
Gas consumption per ton of billets to maintain charge at 820° C. for one hour . .	4·28 therms.

As compared with the results of an identical test in the case of a furnace without regeneration, the following efficiencies were recorded:

Raising Charge to 820° C.

Furnace.	Consumption per Ton.
Without regeneration	31·36 therms.
With "	16·30 "

Maintaining Charge at 820° C. for One Hour.

Furnace.	Consumption per Ton.
Without regeneration	6·70 therms.
With "	4·28 "

Inclusive Calculation per Ton of Billets Heated.

Furnace.	Gas Consumption to Raise Charge to 820° C.	Gas Consumption to Maintain Charge at 820° C. for One Hour.	Total for Operation.
Without regeneration . .	31·36 therms	6·70 therms	38·06 therms
With " . .	16·30 "	4·28 "	20·58 "

In the matter of regeneration, an interesting development in America is the employment of steel tubes which are specially treated by a process known as "calorizing." It is claimed that the treated tubes are preserved for a very long period from the destructive effects of the hot waste gases. The "Calco" system would seem capable of wide application, and should be watched with interest by those concerned with the heating of industrial furnaces with town gas. Of course, we are faced with the problem of the increased capital outlay which the employment of a system of recuperation entails; but there is little question that such additional cost is amply justified in numerous instances. It must be said that the application of such a system has its limitations—for instance, it is generally of little value for intermittent furnace work, and for very small furnaces it is not to be recommended except where extremely high temperatures are required.

To sum up the factors which require detailed attention for efficient furnace design and construction, these are: Correct system of burning gas; proportion of air to combustible gases; external radiation; terminal temperature of flue gas; temperatures of combustion and process; radiation and heat absorption by furnace body; and methods, where practicable, of using waste heat, which is often carried away by hot furnace gases.

To instance the advantages which may be gained by a study of the best means to adopt in using gas for fuel, two typical examples may be cited.

The London County Council Tramway Department required the South Metropolitan Gas Company to investigate the matter of heating steel tram-wheel tyres, as it was thought that the gas-fired system in use was not of the best. Experiments at the Gas Company's Laboratory resulted in the application of an entirely new system, which reduced the consumption of gas from 0·70 therm to 0·20 therm per tyre. A section of the furnace is shown in fig. 1 and a photograph in fig. 2.

The following example is an instance where the improvement effected did not refer so much to reduction in fuel, but to the greatly enhanced quality of the product. A series of so-called drying cabinets, but which are really hot chambers used for hardening the paint on tin plates, were internally fired by gas by means of bar burners situated in the bottom of each cabinet.

FIG. 7.—A view of the Industrial Demonstration Laboratory of the South Metropolitan Gas Company for the purposes of investigating and demonstrating the suitability of gas for industrial heating, and for affording opportunities enabling potential customers to examine the possibilities of gas for meeting their individual requirements.

The fault with the system was unequal treatment of plates, owing to bad distribution of heat. The problem was investigated, and as a result the system shown in fig. 3 and illustrated in fig. 4 was adopted, by means of which uniform and regular heating is now assured.

A very simple and efficient method of furnace construction is shown in fig. 5. A furnace of this type is suitable for operations in which graded or stage heating is required. Fig. 6 is a photograph of a furnace of this description.

Numerous other examples might be recorded, but these must suffice to illustrate the necessity for giving detailed consideration to every problem where improvements are possible. In order that the campaign against the wasteful methods of using the nation's coal which are in operation to-day may be successfully waged, the gas industry must enlist the services of the right type of men to deal with it. Experience has shown the necessity for a fuel technology department, capable of dealing with the hundred-and-one heat treatment processes met with to-day. In numerous instances the South Metropolitan Gas Company have achieved success in this matter solely by experimental research in their laboratories, which has resulted in the elucidation and the correct principles of design and construction of gas-fired appliances. Finally, collaboration of the salesman, chemist, physicist, and the practical designer is essential to progress in the utilization of both coke and town gas in the industry.

I am indebted to Dr. Carpenter for permission to use the information and data contained in this paper. My thanks are also due to the staff of the Physical Laboratory for their assistance in its preparation.

Discussion.

The Chairman said they would all agree that the paper had covered a very wide field. Most of the statements made were actual facts which left no room for criticism. If gas was to be successfully employed as an industrial fuel, it was necessary to pay strict attention to the points indicated by Mr. Chandler—such as the reduction of losses due to radiation, conduction, and sensible heat in the waste gases from furnaces. These points, it must be confessed, had up till recently been honoured more in the breach than in the observance.

Mr. S. B. Chandler (Tottenham District Light, Heat, and Power Company) thanked the author for the valuable data contained in his paper, which would, he said, add lustre to the Transactions of their Association. Speaking as one who had a great deal to do with the industrial applications of gas, he would stress the importance of co-operation between, and co-ordination of, the technical and commercial staffs of gas undertakings. The day when the gas engineer undertook all branches of gas-works practice was past; and the necessity for employing specialists was now recognized.

Mr. W. L. Westbrook (North Middlesex Gas Company) asked the author for further details of the calorizing process, in particular the use of calorized steel for grill plates, &c. It was, of course, impossible to glean from books knowledge which actual experience with plant yielded.

Mr. W. T. Kenshole (Lea Bridge District Gas Company) said the Association were greatly indebted to Mr. Chandler for his excellent paper. Having developed the industrial load, it was most important to ensure a supply of gas of constant calorific value and composition and at a satisfactory and unvarying pressure. With regard to the preheating of the gases, was a limit imposed by the ability of the furnace lining to withstand very high temperatures?

Mr. A. Broadbent (Hon. Treasurer of the Association), referring to the utilization of coke for steam generation, said that two or three years ago Mr. Hugh Seabrook had given them a paper in which he pointed to the need for co-ordinating the gas and electricity industries. Had anything materialized in the meantime?

Mr. J. G. Joyce (Gas Light and Coke Company) asked what type of air and gas controller was used in the metal-melting furnaces illustrated in the paper.

Mr. Chandler, replying to the discussion, said that as a result of investigating the calorizing process, he was very favourably impressed by its possibilities. It was being used extensively and increasingly in America, and he thought there was a big future for it in this country. Several gas companies in and around London were being supplied with calorized gas grillers, which were giving every satisfaction.

At this stage Mr. Chandler exhibited some ordinary cast-iron and wrought-iron regenerator tubes which had been heated to 1000° C. for 16 hours. By contrast he showed a calorized tube which had been subjected to the same temperature for 96 hours. Whereas the latter was unaffected, the cast-iron and wrought-iron tubes had very considerably deteriorated.

He would mention that Messrs. Hadfield had brought out a new material in competition with nickel-chromium, which promised to be of great service to heating engineers. This new material had, without deteriorating, withstood a temperature of 1000° C. for 128 hours, and the same temperature in an open coke furnace for 36 hours. Nickel-chromium alloy withstood such conditions, but, generally speaking, its cost was too high for general use. The new material could be produced at a little over half the price, and calorized tubing cost much less than this. He was in entire agreement with Mr. Kenshole regarding the need for a constant quality and pressure of gas. The South Metropolitan Gas Company had always stressed this point. As to the temperature to which furnace linings could be subjected, there were materials available which were suitable for almost any temperature—certainly up to 1700° C. It was all a question of cost. Mr. Broadbent had referred to the use of coke for steam generation. After the war the London County Council generating station at Greenwich employed a mixture of small coal and coke breeze, burning this by the "Sandwich" system introduced by Mr. Nicol. This proved highly satisfactory. About 40,000 tons of coke breeze were used, and a saving of £8000 was effected as the result of a year's working. What could be done at a large station could be accomplished at the smaller ones. In reply to the question asked by Mr. Joyce, the controllers used were made by Messrs. James Keith and Blackman Co., Ltd.; and these had given every satisfaction. Indeed, their installation had enabled them to compete with foundry-coke costs. For a particular installation, the cost of coke was £513 for twelve months. After replacing by gas-fired furnaces, a saving of £83 was made during a similar period. His experience in South London had taught him that an important factor essential for the successful application of gas to industry was good service. Every gas-fired installation should be inspected periodically, to ensure the consumer's satisfaction. All consumers should be made to understand that the services of the gas undertakings were at their immediate disposal.

Mr. A. Tennant (Croydon Gas Company), in proposing a vote of thanks to Mr. Chandler, said that, in view of the attention which was being given—both generally and officially—to the questions of coal conservation and smoke abatement, the time was opportune for emphasizing the benefits accruing from the use of gas as an industrial fuel.

Mr. J. R. Gale (North Middlesex Gas Company) seconded the vote.

Mr. Leonard Lacey (Hon. Secretary) announced that the summer meeting of the Association had been postponed till June 20.

National Gas Council.—The seventh annual general meeting of the Council is to be held on Tuesday, May 26, at 11.30 a.m.

Wales and Monmouthshire Junior Gas Association.—The third annual general meeting of the Association will be held at Newport, Mon., on Saturday, May 2.

EVOLUTION OF THE VERTICAL RETORT.

Mr. Walter T. Dunn, before the Junior Institution of Engineers.

For a long time, in years gone by, Mr. Walter T. Dunn, M.Inst.Mech.E., occupied the position of Secretary of the Junior Institution of Engineers, of which he later on became Chairman; and last Friday evening he once more did good service to the members, by presenting to them a paper on "Vertical Retorts," which was crammed full of useful information.

Mr. Dunn, during nearly thirty years spent as Secretary of the Institution of Gas Engineers, has, of course, had unique opportunity for the assimilation of gas engineering information; and of his store, he gave unreservedly to his brethren of the "Juniors." To deal with his subject as thoroughly as the author had determined to do necessitated a very lengthy paper indeed; and it was illustrated by a profusion of models, lantern slides, and diagrams, for the loan of which due acknowledgment was made to the Vertical Gas Retort Syndicate, Sir Arthur Duckham, K.C.B., the Woodall-Duckham Company, West's Gas Improvement Company, Mr. Alexander Wilson, M.Inst.C.E., and Messrs. Robert Dempster & Sons. With the author, we entertain no doubt that his colleagues in the Junior Institution shared his admiration of the splendid progressive work of the gas engineer and gas plant manufacturer in the excellent vertical carbonizing systems which he described, but which are, after all, only a part of the complete story of gas engineering; and that they were in full agreement with his claim that in no other branch of engineering is a deeper knowledge of physics, chemistry, and pure civil engineering demanded—knowledge that implies the ability to "direct the great sources of power in Nature for the use and convenience of man." It should here be said that the value of the paper was greatly enhanced by a visit on the following day—which had been arranged by permission of Mr. Thomas Hardie, the Chief Engineer to the Gas Light and Coke Company—to the Fulham Gas-Works, to see a 7 million c.ft. a day Glover-West vertical retort installation at an interesting stage of its erection. Previously the Institution had visited the works of the Tottenham District Light, Heat, and Power Company, where a 6 million c.ft. a day Woodall-Duckham installation was inspected in operation.

The subject was divided chronologically, by description or by illustrations, into nine sections, according to the dates of the introduction of the various systems. The sections were: Scottish Shale Oil (William Young)—1868 and 1872; Settle-Padfield—June 2, 1902; Dessau Intermittent (Dr. Bueb)—July 7, 1902, and 1904; Woodall-Duckham—July 27, 1903; Young and Glover—Nov. 17, 1905; Glover-West—Oct. 4, 1906; Glasgow (Alex. Wilson)—1911; Dempster-Toogood—1912; and Dessau Intermittent Chamber Ovens—1916.

Scottish Shale Oil Retorts.

Mr. Dunn had been fortunate enough to have lent him for the purpose of illustrating the shale oil retorts copies of a set of five working drawings of the Pumpherston patent retort for the Commonwealth Oil Corporation, Ltd., of Mid-Calder, as well as copies of two drawings of Mr. William Young's plant which was in operation at the oil refinery under his supervision. In 1874, Mr. Andrew Scott, of Musselburgh, introduced a vertical gas retort system which comprised a setting of four cast-iron (afterwards firebrick) retorts, each of 12 cwt. coal capacity.* This form of retort was suitable for the carbonization of shales. Steam was admitted into the lower portion of the retort for the production of water gas.

Mr. W. R. Herring, at one time Chief Engineer to the Edinburgh Corporation Gas Department, invented a vertical gas retort setting which was based on the Pumpherston shale oil retort. It was described and illustrated in the "Journal" for Jan. 16, 1906. Drawings exhibited illustrating Young's patent improved retort bench were of interest from the fact that the design of the first installation of Glover-West retorts (erected at St. Helens) was planned with them in view. In 1828 John Brunton patented an intermittent system for the carbonization of coal in vertical retorts. They were filled with coal, and the gas was given off at the top. Rowan, in 1855, patented a system in which the coke was discharged into a water bosh and then raked out from it by hand.

Settle-Padfield.

The late Mr. William Padfield, when Engineer at the Exeter Gas-Works, and his Assistant the late Mr. Thomas Settle, did important work in experimenting with vertical retorts and developing the system which bears their names. Their retort was intermediate between a continuous and an intermittent system. Coal was fed continuously into the retort, but the coke was discharged by hand at intervals—the retort being kept about half empty. In its design, the retort commenced in a vertical plane, but turned off at an angle at the base, so that the coke was discharged through the side of the bench, and not at the bottom.

Dessau Intermittent.

This system of verticals was the outcome of several years' experimental work by Dr. J. Bueb; the first setting being erected at Dessau by the German Continental Gas Association. The system was introduced into England by the Vertical Gas Retort Syndicate, Ltd.; and there are notable examples of it at Sunderland, East Hull, and Melbourne (Australia). A setting may comprise various numbers of retorts, 4 or 5 metres long, arranged in rows of two or three. In the latter type three retorts are controlled by one operation. The producer is placed alongside the retorts, and the regenerative flues on either side. The coal is fed into a charging hopper; and a measured quantity, with a small amount of breeze, is dropped into the retort, and the lid closed. The coke discharging door at the bottom is opened by means of a lever; hydraulic power being employed for operating it.

Mr. Dru Drury (the Gas Engineer at Sunderland) states that the period of carbonization of the charge may be varied to suit differing conditions; but a twelve-hour charge, including two hours of gentle steaming, has been adopted there. At the gas-works at East Hull, under the direction of Mr. R. Nelson, there are five beds of eighteen retorts, each worked in two shifts of eight hours per 24 hours; there being two periods of four hours each during which the bench is left unattended.

Woodall-Duckham.

In the process of invention of the Woodall-Duckham system, said Mr. Dunn, the truly British qualities of pluck, patience, and perseverance were strikingly displayed. Mr. H. W. Woodall (now Lt.-Col. Woodall, C.I.E.), son of the late Sir Corbet Woodall, D.Sc., when Engineer at the Bournemouth Gas and Water Works, had as his Assistants Mr. (now Sir) Arthur Duckham and Mr. H. C. Head, M.Inst.C.E., who is at present Engineer to the Winchester Gas and Water Works; and this trio of young gas engineering enthusiasts worked persistently at Bournemouth on the difficult problem of carbonization in vertical retorts. Their experiences are fully recorded in a paper by Lt.-Col. Woodall which he read before the Institution of Gas Engineers in 1908. After trials with several experimental settings, it was arranged that Mr. Duckham should resign his position of Assistant Engineer to the Bournemouth Gas and Water Company, and devote all his time to the problem of continuous carbonization. Designs were prepared for new plant, and on inspecting these the Directors at Bournemouth decided to erect a bench comprising four settings, each of four retorts, at their Bourne Valley Works. About this time, Mr. Thomas Goulden, of the Gas Light and Coke Company, and Mr. Edward Allen, of the Liverpool United Gas Light Company, reported favourably on the system to their respective Boards; and both Companies decided to erect installations, each of two settings of four retorts. The plant at Bourne Valley was started-up in January, 1907.

In the Woodall-Duckham system there are three standard sizes of retorts, having throughputs of approximately 3, 5, and 7 tons of coal a day respectively. They are 25 to 26 ft. in length, and of rectangular tapered section; the three sizes varying in the dimensions of the major axis—the minor axis remaining the same in all cases. The taper in the length is not continuous from top to bottom. Most of the taper is confined to the upper 10 ft., where the maximum swelling of the coal takes place. Two-stage heating is effected, thus allowing of efficient zoning of the heats in accordance with the requirements of the various coals.

Among the slides shown were the Glasgow plant of 21 million c.ft. per diem (1356 tons of coal), the largest continuous vertical retort installation in the world; and the installation at Innerleithen of 130,000 c.ft. daily capacity (7 tons of coal), which can be worked at 3 tons a day, and is the smallest Woodall-Duckham installation in Great Britain.

Steam is admitted at the coke extractor, and is superheated in cooling the coke.

Young and Glover.

Mr. William Young, of Peebles, and Mr. Samuel Glover, Engineer to the St. Helens Corporation Gas Department, designed a vertical retort setting which was patented on Nov. 17, 1905. An illustration of it will be found in the "Journal" for June 19, 1906 (p. 758). It was founded, in constructional details, on the Scottish shale retorts; but the discharge of coke did not govern the coal feed. The retort was not filled; but it was intended to keep the coal at a constant level, the space above the charge forming a radiant heat chamber for the dissociation of the tarry vapours. The gas also passed through the coal-feeding hopper before leaving the retort. In 1909 Mr. Glover and the late Mr. John West departed from this system, and reverted to that of governing the coal feed by the rate of coke discharge.

Glover-West.

The first Glover-West installation at the St. Helens Gas-Works consisted of eight retorts, each 20 ft. 9 in. long, which were put into operation in 1908, and remained at work until 1915, when they were taken out and replaced by four retorts of a special design. In these eight original retorts a great many varieties of coal from all parts of the world were carbonized under test conditions. The setting embodied all the principles which are still the fundamental idea of the Glover-West vertical retort setting. The retorts were heated by producer gas

* "King's Treatise on Coal Gas," Vol. I., p. 235.

nsumed in horizontal chambers superimposed one above the her in the height of the retort, so enabling the temperature to e varied at will throughout the length of the retort. Incomig coal was heated by waste products circulated in the top ambers, and heat was transferred from the outgoing coke to e secondary air circulated in the bottom chambers.

The second installation consisted of sixteen retorts erected the Droylsden Works of the Manchester Corporation, to e order of the late Mr. J. G. Newbigging; and the results of vere tests were given in a paper on "The Scientific Carbonition of Coal," which Mr. Newbigging read before the Institution of Gas Engineers at their Glasgow meeting in 1911. n this case 2 ft. 3 in. was added to the length of the retort, and e shape was altered to an increasing but changing ellipse, hich began at the top with straight sides and semi-circular ds 30 in. by 10 in., finishing in an ellipse at the bottom 36 in. 22 in. This increased the capacity from the original 2 tons 2½ tons a day. The retorts remained, with minor repairs, operation from 1910 to 1921, when they were re-built, with rtain modifications. Mr. W. Buckley published the results the eleven years' working in a paper on "The Maintenance osts of Continuous Vertical Retorts," which he read in May, 923, before the Manchester District Institution of Gas Engiers.

Other installations followed rapidly, and some of those inolving modifications in one form or another were described Mr. Dunn, and illustrated by slides. By 1918 the experince with the Droylsden elliptical retort had become sufficiently ngthy and full to show that, not only was the elliptical shape rrect, but that it must be developed in a particular way. n ellipse which in the descent of the retort involved a rapid hange in the shape of the major sides gave rise to spaces left etween the charge and the retort wall, with consequent inonveniences. These were avoided by constructing the retort ith a constant curvature in the major sides; and the standard hape was fixed on the firm foundation of experience and estabshed fact. The new design was introduced simultaneously at afford and Montreal. The retort was 53 in. by 10 in. over e major and minor axes respectively at the top, and it ineased at a constant angle to 39 in. by 18½ in. over the length 21 ft.

The demand of the country for fuel oils during the war led r. John West to undertake at St. Helens experiments in eaming the charge, which has since become the generally lopted practice in the operation of continuous vertical retorts. o far as the results concerned the production of fuel oils, and e establishment of the practice of steaming, they were pubshed by Mr. West in a paper which he read in November, 917, before the Southern Association of Gas Engineers and anagers. The St. Helens Gas Committee were so far connced of the practicability of the 40 in. retort that it was lopted in the third vertical retort installation, consisting of retorts, with an estimated capacity of 2 million c.ft. of gas day, erected there in 1921.

In 1920, the "New Model" retort was patented. This was othing more than the 33 in. by 10 in. retort 21 ft. long exnded to 25 ft. by the addition of a so-called "steaming chamer" at the base. The function of this chamber was to prode a zone in which the hot coke would be available for the irpose of raising the temperature of the steam to that of dsociation before it reached the retort proper, thus securing the lvantages of steaming without deducting from the heat necesry for dry distillation in the retort itself. The immediate fect of this development was that the retort was proved to be pable of carbonizing 50 p.ct. more coal per day, and producg from 50 to 100 p.ct. more gas; and this increase of capaty was obtained at a trifling increase in first cost per retort. he economic effect was that the capital cost of the Glover-'est system per unit volume of gas produced was reduced to e pre-war level. The extension of the new principle to the in. retort was the most natural direction for the next and last ep in the development of the Glover-West vertical retort. hat this design of retort has proved satisfactory is shown by e fact that it has been adopted by the Gas Light and Coke ompany for their Nine Elms Installation.

Glasgow System.

The Glasgow system of continuous-intermittent—continuous regards production of gas, and intermittent in relation to e processes of drawing and charging—vertical retorts, the inention in 1911 of Mr. Alexander Wilson (then Chief Engineer id General Manager of the Glasgow Corporation Gas Department) was introduced specially to deal with the hard nonking Scotch coal used by that undertaking. Neither the inrmittent nor the continuous system appeared fully to meet he requirements of the situation. A trial setting of four retorts as in operation at the time of the 1911 meeting in Glasgow the Institution of Gas Engineers, during Mr. Wilson's presiency. Various improvements were afterwards made; the setng giving encouraging results from the commencement.

With this system no constantly moving machinery is required; and the coke is cooled in bottom cast-iron chambers, which are attached movable buckets for holding the water als. These buckets are actuated by a small hydraulic ram. he retorts are heated in a simple manner; the producer being carried to the top of the setting. Fuel gas and secondary air are admitted between each of the top sections of the retorts, in parallel streams, so that little mixing takes place in the top section. The mixing of the gas and air, with the consequent combustion, takes place in the second section; the temperatures becoming gradually reduced in the downward travel of the gases.

Results obtained from the trial setting justified the decision to erect at Glasgow a 4 to 5 million c.ft. per diem installation on the site of a 2 million c.ft. section of horizontal retorts which were worn out and required complete renewal.

Dessau Intermittent Vertical Chamber Ovens.

This system is a development of the former Dessau intermittent vertical retort, and its construction in this country is in the hands of the Woodall-Duckham Company. The capacity of a plant now in course of erection, and having 25 chambers at 2¼ tons per charge per chamber, will be 112½ tons a day. This should make about 7800 therms a day, equivalent to some 1¼ million c.ft. The advantages claimed for the intermittent vertical chamber oven are the high rate of therm production per square foot of ground area; steaming can be carried out to an extent which is not possible with the horizontal system; low labour costs; absence of machinery, since charging and discharging are performed by the force of gravity; bulk quenching, resulting in a low moisture content in the quenched coke; absence of heat from the space in the chambers, producing superior qualities of tar and ammonia, and a higher quality gas; fewer occasions as compared with horizontal retorts for discharging coke, and consequent reduction of attendant losses. As each chamber is entirely separate, neighbouring chambers are not affected when being charged or discharged. The intermittent vertical chamber has been successfully operated with all classes of coal. With the use of best silica material for the chamber walls, there can be no sticking of charges. The adoption of the big chamber is better from this point of view than the old type of small Dessau retorts.

In closing, Mr. Dunn emphasized the great importance of the waste-heat boiler in connection with vertical retort installations, and referred the members to the paper read in November, 1923, before the Southern Association of Gas Engineers and Managers, by Mr. J. S. Thorman (Engineer of the Stratford Station of the Gas Light and Coke Company), entitled "Waste Heat and Its Insulation from Glover-West Verticals and other Carbonizing Plant."

Appreciative Remarks.

At the conclusion of the paper—the reading of which had, from considerations of time, to be somewhat curtailed—a number of questions were asked, and numerous indeed were the expressions of gratitude to Mr. Dunn for the great trouble to which he had gone in its preparation, as well as of congratulation upon the excellent results of his work. The Chairman (Mr. Edgar) said that Mr. Dunn had always taken a keen interest in the Institution, and it was greatly owing to his efforts that it had attained its present strong position.

Those taking part in the discussion included Mr. Gardner, of the Wandsworth Gas Company; Dr. E. W. Smith, of the Woodall-Duckham Company; Mr. R. J. H. Sayers, of West's Gas Improvement Company; and Mr. George Evetts—who pointed out that the vertical retort permitted the force of gravity to be used, once the coal had been got into the first required position, and, in addition to this, the plant itself was remarkably flexible. He agreed with Mr. Gardner in his contention that the horizontal retort was "not dead yet."

Dr. Smith explained that the resuscitation of the intermittent system was to meet the case of some districts where there was a demand for much denser coke than was made in the continuous vertical retort. Such coke could be produced in the intermittent retort, and gas made from the installation at approximately the same price per therm as with the continuous retort. The author had dealt in a most tactful and delicate way with the various competitive systems. He advanced an earnest plea for co-ordination in dealing with the vital fuel problem of the country.

Mr. Sayers, adding his meed of praise to the author, remarked that the paper contained a very complete history of the development of the vertical retort. He enumerated the main advantages of vertical retorts, and pointed out that provision was made for regulating the throughput so as to meet the carbonizing requirements of different kinds of coal. Extensive investigation had shown that there should be no difficulty whatever in carbonizing any class of coals—including such as were supposed to be "sticky," like Durham coal. At a great many works on the Continent, Durham coal was carbonized both in Woodall-Duckham and Glover-West retorts; and he did not think that in any of these works they would care to revert to the horizontal system. In addition to their other advantages, vertical retorts made a strong appeal to gas engineers from a coal conservation point of view.

In his acknowledgment of the many kind things that had been said, Mr. Dunn assured the members that he would always be ready to do anything in his power to assist an organization so near to his heart as was the Junior Institution of Engineers.

THE AUCKLAND AND DEVONPORT (N.Z.) GAS-WORKS.

The following brief description is taken from the Presidential Address of Mr. James Lowe, M.Inst.C.E., at the First Annual Meeting of the Gas Institute of New Zealand, which was held in February.

Auckland Works.

Gas was first supplied from the present manufacturing station at Beaumont Street in April, 1904. Prior to that date the old works at Nelson Street (shortly afterwards closed) had been the scene of manufacturing operations, since the start of the Company. The total area of the present site is a little over 14 acres; and on it the whole of the manufacturing plant, with the exception of the gasholders, is accommodated.

There are two gasholder sites, one of $1\frac{3}{4}$ acres at Freemans Bay, close to the works, where there are two 2-lift holders of 500,000 and 1,000,000 c.ft. capacity respectively; and the other of $3\frac{1}{2}$ acres at Beresford Street, about three-quarters of a mile from the works, where there is one 3-lift holder of 2,300,000 c.ft. capacity, and room for another of considerably larger size.

The site of the manufacturing station at Beaumont Street was originally on the side of a hill; the frontage at Beaumont Street being at sea-level, and about one-half of the area being 60 to 70 ft. high. It was originally intended to excavate the whole of this area to the level of Beaumont Street, but this intention was changed at a later date; and the top of the cliff was set aside for purifiers and extensions to them, tar and liquor storage plant, station meters, sulphate, anhydrous ammonia, and tar plants, &c. The frontage to Beaumont Street has been excavated as a site for retort houses and No. 1 coal store, workshops, offices, coke yard, &c.; and the boiler house,

Inclined Portion of Rope-Driven Suspension Railway.

engine room, scrubbers, washers, and condensers have been placed on a bank 12 ft. above yard-level.

No. 2 coal store has been carved out of the cliff at its northern end. This store is 174 ft. broad by 240 ft. long. It is made in four sections, each of which is built above a tunnel 240 ft. long driven into the cliff at right angles to Beaumont Street. The tunnels have been built to contain conveyors; and a "Marcus" conveyor is at work in one of them. Each section of the coal store forms a hopper, and the coal gravitates through revolving drums from the store on to the conveyor. The revolving drums are mechanically driven, and their speed can be varied so that the mixture of coals delivered to the conveyor can be altered at will. The cliff is composed of a sedimentary rock called papa, with a 12 ft. overburden of clay; and as this rock disintegrates, or weathers, when exposed to air, the store had everywhere to be lined with concrete, and reinforced where necessary. The height of the store from the underside of the roof trusses to the top of the tunnels is 42 ft. The inclined floors are lined with concrete, 6 in. thick; and all the walls except the front wall, which has no support from the cliff, are 18 in. thick. Each section of the store will contain 4500 tons, or an average of 18,000 for the four sections, without trimming. If the top of the coal were trimmed level, this figure could be increased to 25,000 tons.

Rope-Driven Suspension Railway.

As the top of the store is about 60 ft. above yard-level, it was designed to be filled with coal by a Bleichert rope-driven suspension railway, with automatic coupling and uncoupling apparatus for the cars. The loading station is a pit in the yard, and the cars rise 68 ft. up an incline to the top of the store, and then travel round a track shaped like a gridiron, with both right and left-hand curves, and down the incline to the loading station. As the war supervened, it was not possible to make a contract with the Bleichert firm of Leipzig; and we had to design, construct, and erect the railway. Before doing this, inquiries were made from a number of British makers of coal conveying machinery; but none would undertake the work.

The ropeway has at present a total length of about 800 ft. Each car carries about one ton of coal, and the capacity of the ropeway with six ropeway cars is 75 tons per hour. When the number of cars is increased to twelve (the maximum), the capacity will be 150 tons per hour. The traction rope is of the best extra-tough cast steel, $\frac{1}{2}\frac{3}{8}$ in. in diameter, with a breaking strain of about 95 tons per sq. in. It is driven by a 40-H.P. motor. This is necessary for the starting torque, but when the track is evenly occupied by cars, only 20 to 25 H.P. is required. The rails in the loading pit are laid with a slight gradient, so that one man can easily push a loaded car. On entering the loading terminal, the empty cars uncouple automatically from the traction rope, and are pushed by a workman in front of the loading chutes. The loaded cars are then pushed to the exit, at which point they grip the traction rope automatically, and are carried up the incline and round the track over the coal store, finally returning down the incline to the loading pit. When the current is switched off, the mechanism is prevented from moving by means of a solenoid brake on the driving shaft of the motor.

No. 1 coal store alongside the horizontal retort house is 250 ft. long by 70 ft. broad, with walls 30 ft. high. Its capacity is about 13,000 tons of coal, and it is filled by a gravity-bucket conveyor of a capacity of 50 tons per hour. Coal comes into the works in steel hopper wagons of 10 to 12 tons capacity running on the Company's street railway along Beaumont Street from the Western Wharf. Larger wagons cannot be

Water Gas Plant at Auckland.

used, since the small radius of the curves (68 ft.) limits the length of the wheel base to 6 ft. 6 in. Coke-fired locomotives supply the motive power for this railway.

Carbonizing Plant at Auckland.

The present carbonizing plant at the Auckland Works consists of 23 beds each containing nine horizontal retorts 24 in. by 16 in., 20 ft. long, and seven beds each of eighteen intermittent vertical retorts 13 ft. long. The horizontal retorts are charged by De Brouwer charging and discharging machines, and the coke is removed to the yard by a De Brouwer hot coke conveyor. Sixteen of the horizontal retort beds were originally built as settings of eight's. They were later rebuilt as nine's when opportunity offered, and additional beds of nine's up to the number of 23 were built. The house is now in process of conversion to settings of twelve's. This means that the arches have to be raised 2 ft., and the stoking machinery has also to be raised.

The hot coke conveyor will be discarded, and the telpher track, which will replace the conveyor, is already in position outside the retort house.

Water Gas Plant.

Three water gas plants are in continuous use. Two of these have been installed in conjunction with the horizontal retort house, and one in conjunction with the verticals. They are automatic in action, and the blow gases are utilized to heat the coal gas retorts. The hot water gas is passed through the vertical retorts; but, when used in conjunction with horizontals,

is passed, after being partially cooled, directly into the foul main.

Purifiers.

The purifiers are all of the water-lute type. There are twelve altogether; the last set of four boxes being built in 1913 on the top of the cliff. The boxes of this set are 27 ft. wide by 8 ft. long by 6 ft. deep, and are built two in a piece on a ferro-concrete framework, so that the bottoms of the boxes are 4 ft. above the ground. There is no permanent roof over these boxes, but two movable gantries running on rails and carrying a roof are provided. These gantries carry rope hoists capable of movement in vertical and horizontal directions, for lifting the oxide from ground-level and depositing it at any point in the boxes. Both the rope hoists and the gantries themselves are operated by hydraulic power.

Devonport Works.

The area of the site of the Devonport Gas-Works is about six acres. The land at the northern end of the site has been reclaimed from Shoal Bay. The land on the southern end is about 50 ft. above sea-level.

Travelling Gantry Carrying Hydraulic Hoist for Loading Purifiers with Oxide.

The coal store has been formed by excavation in this higher ground, the sides of the excavation having been trimmed to an angle of about 30°, so that the coal gravitates to a tunnel driven north and south under the coal store, where it is filled into tipping wagons which convey it to the coal breaker and elevator. The coal entering the works has to be carted, and is discharged by tipping carts or motor wagons from transverse bridges lying east and west across the store, and 21 ft. above the top of the tunnel.

The carbonizing plant consists of intermittent vertical retorts and water gas plant. The coke is removed from the retort house by hot coke tipping wagons which run under the retort bench, and are hauled up an incline by a wire rope, after being quenched outside the retort house. The breaking and screening plant and coke hoppers are at the upper end of the incline, and yard storage is obtained by tipping the wagons on the incline.

Manufacture of Firebricks and Retorts.

The manufacture of firebricks and retorts as a branch of the Company's business was begun about the year 1884. Fireclay of excellent quality is obtainable from the neighbourhood of Whangarei; and the bricks and retorts produced are not inferior to the best which can be imported.

View Inside Firebrick Works.

The works are up to date. Advantage has been taken of the slope of the ground to terrace the site, with the object of getting some help in the transport of material by gravitation. The drying sheds are provided with steam-heated floors, and hand labour is displaced by machinery where it has been found advantageous to do so. A semi-continuous gas-fired kiln of five chambers is at work; and when the output justifies it, this kiln can have additional chambers added to it, which will make it continuous. The life of the material in the horizontal retort settings is from seven to nine years.

VIEW OF THE DEVONPORT WORKS.

CHEMICAL TOPICS FROM CURRENT LITERATURE.

Notes from Recent Technical Publications.

By H. J. Hailstone, A.M.I.Chem.E.

Steam Raising.

An excellent aid to the control of combustion in steam boilers is referred to by C. E. Wade in an article on "Economy in Steam Raising" published in "Chemistry and Industry." In order to indicate the correct adjustment of air to fuel supply on boilers using coal, a simple attachment known as Carr's combustion indicator is fitted. This consists of a steam supply taken from the boiler through a coil in one of the flues, and in this way superheated. The steam then issues through a jet and induces a stream of the flue gases with it to a discharge pipe in front of the ashpit. Deficiency of air is immediately indicated by the presence of smoke at the discharge; and this may be rectified so that only a mere trace of smoke is perceptible.

Coke—and the Competition.

Reference to previous contributions under the heading "Chemical Topics" shows that the subject of coke has always been well borne in mind; and most readers need little reminding of the enormous dimensions to which the technical literature of this subject has grown during the last ten years. Sir Arthur Duckham's magnificent stimulus to further work, and the publication of really useful practical knowledge will, it is certain, do much towards clearing up many debatable points and establishing some definite and sound practical principles concerning the technique of economic production and handling of the grades of coke suited to the domestic and industrial requirements of this country. Every week brings fresh contributions to the study of the subject; and it is always difficult to select the most important items from a field of information having such intricate ramifications. One of the most notable of the recent contributions was Dr. Weyman's paper entitled "The Combustion of Coke in One Stage," now printed in the Transactions of the Society of Chemical Industry. This has already appeared in the "Journal" (Nov. 26, 1924, p. 570), and readers will have noted the very wide range of problems and phenomena dealt with. For a comprehensive bibliography of coke reactivity, ignition temperature, and structure the original article should be consulted. Another article of great interest on the same topic recently appeared in "Brennstoff-Chemie." Therein H. Bähr deals with some of the factors which determine the properties of coke. A knowledge of the moisture and ash content of the coal employed, together with the bitumen content and coking power, gives a basis for adjusting coking conditions. This basis may be further investigated by experimental tests at different temperatures and with different mixtures. The resulting coke may be examined for three significant properties—ignition temperature, reaction temperature, and reactivity—in one apparatus consisting of an electrically-heated quartz tube. On raising the temperature until carbon dioxide is formed in the current of air passed through the heated coke, the ignition point is recorded. Carbon dioxide is then passed through the tube, and further heat applied until carbon-monoxide may be detected in the gases; this point being the reaction temperature. The reactivity is obtained by still further heating the coke to 950° C. in a current of oxygen or carbon monoxide, when the proportion of carbon dioxide to carbon monoxide in the waste gases gives a measure of the reactivity. Valuable information can be obtained by investigations along such lines.

Iron and Steel Corrosion.

Mr. U. R. Evans has made a further contribution to this subject, and in a paper appearing in the Transactions of the Society of Chemical Industry deals especially with water-line corrosion—a matter of particular interest on the gas-works. Details are given of steels submitted to immersion tests in various dilute aqueous solutions; and, though useful information is yielded by such tests, it is pointed out that loss of weight of specimens treated in this way gives no correct indication of the damage done. The reason for this is due to the fact that, though equal amounts of corrosion may have taken place with two samples, in the one case the action may be local, and so result in pitting or even actual perforation, while in the other the damage may be general, and hence of much less significance so far as the life of an article may be concerned. The use of corrosion inhibitors is discussed at length.

Fractionation.

Interesting data regarding the working of fractionating columns having moving parts have been obtained by Messrs. Myers and Jones; and the report of their investigations has appeared in the Journal of the Chemical Society. The efficiency of fractionation, and also of gas washing, is, of course, largely dependant upon thorough contact between the vapours and liquids in the successive sections of the column; and the simplest mechanical aid to this end takes the form of a vertical revolving shaft with suitable plates or discs which serv to scatter the descending liquids as they pass from section t section. In separating the constituents of a mixture of benzen and toluene by fractional distillation, the influence of the spee of rotation of the shaft was very marked; increase of speed re sulting in more complete separation. This principle, whicl has been employed for years in certain types of vertical ga washers and ammonia stills in use in the gas industry, shoul find practical application on large-scale distillation plants, pro vided the probably greater initial cost and running expenses (a compared with those of the ordinary bubbling type of column are compensated by increased efficiencies and throughputs. O such a scale, however, it is likely that some device for sepa rating entrained spray will be found a necessary adjunct; an since the peripheral velocity of the disc is a determining factor comparatively low speeds of rotation could be employed.

Gas Analysis.

Two new reagents for the absorption of oxygen from mix tures of gases have been put forward. L. F. Fieser advises the use of a mixture of sodium anthraquinone sulphonate and sodium hyposulphite (see Journal of the American Chemical Society), and claims that this reagent works as quickly as the ordinary alkaline pyrogallol solutions in everyday use. Another reagent is due to Hofer and Wartenburg, who give, in "Zeitschrift für Angewandte Chemie," details of a method for determining oxygen. A solution of indigo carmine in sodium hyposulphite is employed, and a change of colour as compared with standards is noted after the passage of a measured flow of gas. Thus the oxygen content is arrived at after suitable corrections have been made.

"Zeitschrift für Physicalische Chemie" gives a method, due to L. Löwenstein, for determining hydrogen and methane. The gas containing these constituents is passed with an excess of oxygen through a combustion chamber, and the water formed (hence the hydrogen equivalent) is indicated by means of a hair hygrometer. Two new types of gas analysis apparatus designed by M. Dirken (Journal of Scientific Instruments) and H. D. Murray (Journal of the Chemical Society) have been noted. The former apparatus possesses a readily detachable absorption vessel in which the sample is shaken; and during this interval further samples may be dealt with in additional absorption vessels. Thus, when a large number of tests are required in a short time, this arrangement is particularly useful. Mr. Murray's apparatus is a portable one; and for this feature particular advantages are claimed. The burette has a three-way tap at the top; one limb leading to the sampling tube and the other to another three-way tap. This latter serves a receiving vessel containing mercury, and a special pipette. The gas sample is drawn into the burette containing water, and then passed through a jet into the absorbing solution in the pipette. Finally it is returned to the burette for re-measuring. Further absorptions are made in the receiving vessel, which may alternatively be used as an explosion vessel for determinations of hydrogen and methane.

Ammonia Estimation.

The determination of ammonia in its salts may be made by adopting the method outlined in "Zeitschrift für Analytische Chemie" by S. Lövgren. According to this method the solution of the salt is titrated with standard caustic soda, and thymol phthalein is used as indicator, giving a blue colour when the equivalent amount of alkali has been added. To obtain correct indication, one of the necessary precautions is that the solution contains at least 50 p.ct of alcohol; but the use of this may be dispensed with by making comparison tests.

Laboratory Apparatus.

"Chemistry and Industry" publishes a description of a laboratory wash-bottle designed by E. A. Roff. This enables a steady jet of liquid to be directed without the need for continuous blowing. In principle it is similar to the familiar type fitted with a bunsen valve on the inlet tube, and having a release tube controlled by the finger. The improvement consists of having a glass valve on the inlet tube, instead of a rubber one, which easily perishes. A further glass valve is fitted at the bottom of the outlet tube; and this serves to keep the jet always full of liquid, so preventing splashing when washing precipitates on filters, &c.

The mention of filters brings to mind the new sintered-glass filters manufactured in Jena and now being marketed in this country. These should rapidly find favour in gas-works laboratory operations. A recent illustrated list issued by Messrs. Baird and Tatlock gives full particulars of the various types of apparatus obtainable fitted with this filtering medium. By their use, ordinary filter-papers may be dispensed with in many quantitative and qualitative tests; some idea of the wide range and nature of their application being given in the descriptive list referred to.

Institute of Cost and Works Accountants.—The fourth annual costing conference will be held at the Hotel Great Central, Marylebone Road, London, N.W., on Friday, May 1.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

Discussion on Maintenance.

(*Concluded from p.* 178.)

Mr. H. H. Gracie (Edinburgh) said it was imperative, if they were to retain the business they already possessed, that some form of free maintenance should be introduced. They were therefore indebted to those pioneers who had taken, and were taking, active steps to promote such an end. Some time ago a proposal originated with the Housing Committee in Edinburgh to the effect that the Gas Department should maintain the installations in good order, even to the extent of supplying mantles for the incandescent burners. The idea was that an extra charge should be made for the gas consumed by way of prepayment meter. The majority of the Gas Committee, however, did not favour the upkeep of mantles, though a suggestion was made to limit the number given free per annum, and it was also arranged to leave a spare mantle free in case of emergency. A modified scheme was prepared, under which four regular visits to each house per annum were to be made, when the various burners and apparatus were to be cleaned, adjusted, and put in full working order. Any other attention required was to be notified by a consumer by postcard or otherwise. Under this scheme, the extra charge for gas was comparatively small; but it did not receive the sanction of the Committee. The good results obtained in other towns might, however, cause his Committee to reconsider their decision on this important question. It seemed to him that attention should be directed to the steps being taken by a strong Committee of the National Gas Council to submit suitable suggestions to the Board of Trade for the examination of all piping, fittings, and appliances on the premises of consumers. The work which was now being carried out in many centres in connection with maintenance schemes was sure to disclose much valuable information. While they had not in Edinburgh a complete door-to-door visitation for the purposes of maintenance, still, they had a very complete system for following up and maintaining cooking, heating, and hot water appliances. One would expect that, with a well-planned scheme of this sort, the condition of the appliances would be so improved that attention would be required only at comparatively long intervals; and as a result, the general run of complaints would be reduced. He would like to ask those who had followed out this practice whether it was their experience that, after an appliance had been thoroughly overhauled and the defects remedied, it could safely be left without further care. The showrooms—or, as they were sometimes wisely called, the demonstration rooms—were now playing an important part in the maintenance campaign, by displaying under the best working conditions only the latest appliances. There was no doubt that they were promoting a good feeling with the plumbing and ironmongery trades; and their ideas of selling the goods to yield them a fair margin of profit was bringing people to the showrooms to make purchases. In this way it seemed to him they were ensuring that only the most reliable, as well as the most efficient, appliances were being fixed in the district. The ideal would be realized if they could get all the tradesmen to come to them for their supplies. If they could not do this, it would be only open to them to purchase and fit appliances which the Gas Department had tested and proved to be thoroughly reliable and economical in every way. The whole gas concern, which, in municipal areas, was the property of the community, would then be carried on in the best interests of the community. They must bring home to the gas consumer the fact that they were his best friends. They must show him that they were out to save him from the ill-suited and ill-designed fittings to be found in almost all districts.

Mr. David Vass (Perth) considered the subject was one they should seriously take to heart. In Perth they had been following somewhat on the lines suggested by Mr. Napier. They had a public showroom, and supplied from there the whole trade of the district. The Gas Department worked very harmoniously with the plumbing trade. Following out, however, the suggestions made by Mr. J. W. M'Lusky in the course of his Presidential Address to the Association last year, the question of maintenance had been tackled in Perth. A proposal was made that mantles should be provided over the whole city for a year at a fixed charge; but that idea did not "catch on," and he began to consider seriously if something on the lines of the Glasgow scheme would not be practicable in Perth. In the old days, they had a system of inspection of fittings; but due to economy, or some idea of that nature, the system of inspection was allowed to lapse. Later he suggested reviving that system of inspection of all appliances; arguing that the Gas Department were losing all over the town to electricity, and that the one way of successfully coping with the opposition was to have two or three fitters specially trained for the work to make a door-to-door canvass of the city. Experience had shown that if people were dissatisfied they were likely to continue dissatisfied so long as no official or fitter from the Gas Department visited them. He enumerated a few instances of pleased consumers, and maintained that these had resulted from the maintenance and inspection scheme which had been adopted in Perth. The scheme had only been in operation since Jan. 1, and so it was probably premature to say much on the question of cost. The expenditure in wages ran to something like one-third of a penny; and so far as he had gone, he was quite confident that the same staff as at present would be able to overtake the whole town and give two visits each year to all the districts. From his own experience, he thought Mr. M'Lusky's figures were quite well founded, and that all undertakings in the country ought to take the forward step of free maintenance. He had omitted to say that in Perth they started away with a scheme of renewing service pipes over the whole town; and this scheme had been in operation now for eighteen months. Originally it was intended to spread the work over five or six years; but they had since decided to concentrate on a complete renewal. The result was that every service in the town would be ample for years to come.

Industrial Consumers and Maintenance.

Dr. E. W. Smith (London) asked if the maintenance scheme in Glasgow covered industrial gas. If so, what happened if they found that for a particular operation the appliance used was not the right one? He knew it was a difficult point to settle. He came across an instance of this in the printing trade in London. Two years ago, probably about 5 p.ct. were on gas for metal melting; but now the remaining 95 p.ct. had adopted the idea, and were effecting a considerable saving. He supposed that with a proper maintenance system the gas undertaking would satisfy itself that the particular plant which was being used was the proper one to work with.

Mr. S. Milne (Aberdeen) felt the time was coming when they would have to face this question of free maintenance. In Aberdeen, since they put in gas radiators, they had made a periodical inspection of them; but up to the present they had not gone in for a properly-organized scheme. Mr. Vass had pursued the proper policy in tackling the service pipes. Proprietors of the older properties were slow to move in the matter, especially if it involved expenditure. Obviously the proper thing to do was for the gas industry to do the work itself. He had been struck with the figures given by Mr. M'Lusky. Certain inquiries that he (Mr. Milne) had made into this question of free maintenance had caused him to reckon that it would take about 2d. per 1000 c.ft. of gas used for domestic purposes only. Mr. Napier had rather suggested that the industrial consumers would have nothing to say, because they already had a special rate. This might be true; but he thought they should not stop at the domestic consumer. In Aberdeen they had lately introduced the practice of going over hotels, restaurants, and such places; and he was bound to admit that these quarterly inspections had been greatly appreciated. They charged a small fee, which was not grudged. He would like to ask Mr. M'Lusky how often particular premises would be visited in the course of a year; and he would also be glad to have an outline of the work done by the inspectors in Glasgow. Was each inspector confined to a particular district, and had he allocated to him a certain number of houses? Further, did the Glasgow Corporation supply gas brackets and pendants, and what was the position if, for instance, chandeliers were condemned? He noticed Mr. Napier advocated a service pipe laid at the expense of the gas supplier right up to the meter. Had Mr. Napier adopted this scheme in his own case?

Mr. J. J. Scott (Cowdenbeath) said in his district they had all along supplied a free service right to the meter. Not only so, but supplied free cookers. Indeed, they went even further than this, and actually provided internal fittings. During the past four years or so, they had added something like 1300 new consumers in whose houses they had supplied internal pipes, brackets, and fittings. Such a scheme as this appealed most strongly to him in that it made every householder a consumer. They charged a small additional sum per 1000 c.ft. to cover the cost of the internal piping system. They had trained their consumers to report all complaints in any shape or form. Indeed, they had educated them up to the practice of applying for information, assistance, and advice at the district gas office or showroom. Cowdenbeath was a mining locality, and not unnaturally they had experienced a good deal of trouble because of underground workings. The cost of the free maintenance scheme in Cowdenbeath did not exceed ¾d. per 1000 c.ft. He had been much impressed by the data given by Mr. M'Lusky, and would carefully examine the possibilities of changing-over to a definite periodical visitation scheme.

Mr. R. Sturrock (Ardrossan) explained that in his district they introduced a maintenance scheme eighteen months ago, and the cost worked out at 0·52d. per 1000 c.ft. Complaints had been considerably reduced.

Mr. A. Dow (Galashiels) could not give any figures relative to his maintenance scheme, because it was in its infancy. Inspectors had been instructed to make periodical visits, and the expectation was that each house would be visited at least once every three months. They did not propose to stop at supplying domestic fittings. In fact, in a preliminary sort of way, they had been giving attention to gas engines and industrial consumption generally. They had on the staff an engineer trained in gas engine work, and his services were always available to consumers. A record was kept of the consumption of gas among the power users; and if in any particular factory or workshop it appeared to be abnormal, an immediate visit was paid to the place, and inquiry made as to the reason. Should the gas engine require attention, a report was made as to the overhaul necessary; and if the manufacturer gave his sanction, the Gas Department were prepared to undertake the work. By this plan of campaign they had retained a good deal of valuable engine consumption in the district. Free maintenance ought not to stop at the domestic consumer. It could be adopted with success in industrial centres.

Piping Schedules.

Mr. John Wilson (Motherwell and Wishaw) said it had been stated that one of the first things in maintenance was the service pipes. He would include in maintenance, not only the service pipes, but the pipes in the houses themselves. What was the use of providing a proper service pipe, if the pipes in the houses were not in proper order? Had not the time come when the National Gas Council or some such body—the Scottish Section of the Council could do it—should schedule the sizes of service pipes for various houses and conditions? At the same time, a schedule could be drawn-up of the sizes of pipes for carcassing houses. The time had come when these things should be put down in black and white by a responsible body. This had been done already under the Gas Regulation Act with regard to the quality and pressure at which gas was supplied. It was only reasonable that house proprietors should be compelled to put in such pipes as were required by the schedule. Gas departments should have the same rights as water departments—to insist upon defects being put right. Mr. M'Lusky's figures, he believed, would prove effective in convincing gas companies and corporations that free maintenance paid its way. Perhaps Mr. M'Lusky would enlighten the meeting as to the type of individuals he employed as maintenance men. While speaking of reform, it might now be made clear that the town or burgh chamberlain's duty, in a municipal sense, should stop at the collection of the cash. The gas department

should control their own work right to the consumers, and be responsible for the reading of meters and the preparation of accounts.

Mr. David Fulton (Helensburgh) said they must first of all be satisfied that in the works they were producing absolutely pure gas. Then he was quite sure that the cost of maintenance would be negligible.

Replies by the Authors.

Mr. M'Lusky, replying to some of the points raised, remarked that Dr. Smith seemed to be concerned about industrial plant. In Glasgow there were a number of industrial plants; and it was the duty of the maintenance men to see that the regulation was right. If any point of difficulty arose, the maintenance staff could report to others who had charge of bigger industrial plants. The ordinary maintenance men were not expected to tackle a heavy industrial undertaking, except to make small adjustments and give advice. When they came to the end of May, he would have completed four financial years of the service pipe campaign, and in that time would have laid down a total of 30,000 pipes. From his own experience, he would say that, if they could guarantee to visit houses twice a year, it would make a great improvement. Eventually the maintenance might be extended to three times a year, but he would not go the length of saying that there should be four visits annually. As a matter of fact, twice a year to begin with would probably give satisfaction. In Glasgow they had sectional depôts and centres; and the system on which they operated was that one inspector had charge of 10,000 consumers. The ultimate scheme was to be ten inspectors, with forty men each. At the moment they were now running with 215 men—consisting of 184 actual house-to-house maintenance men, 9 staff repairers, 11 inspectors, 2 storekeepers in the depôts, 8 clerks on the general clerical work, and 1 controlling superintendent. The meter inspectors in Glasgow were clerks. Their duty was to read the meter and book the record. On the other hand, the maintenance staff was drawn from plumbers and gasfitters—men who had gone through a special test and training for work of this kind. In the selection of these men, regard must be had to their appearance and general demeanour. Men of the type required were not very plentiful. There were plumbers and gasfitters who would be useless for maintenance work. In regard to the apportionment of the cost of the Glasgow maintenance scheme, the principle followed was to calculate the charges on the total consumption of the city. The viewpoint they adopted was that everybody in Glasgow must pay for the maintenance scheme. He did not see how the allocation could be made in any other way. His costs had come down automatically, because they had done the worst parts, and were now passing into better property. The cost would remain, he should say, at ½d. He did not think it would be possible to bring it below this.

Mr. Napier said it appeared to him that the gas undertaking in the future must include, not only the manufacturing works and the distribution system, but all appliances used by consumers. Town councils, in the matter of laying-out new roadways and pavements, called upon the proprietor to meet the first cost. Afterwards the local authority took over these roadways and pavements and maintained them. This was done in the interests of the community. Gas supply also was a communal necessity, and he saw no objection to the local authority obtaining powers for the gasfitting of houses to be carried out to their approved specification. The initial expenses would be met by the proprietor, and afterwards by the gas department. This would strengthen very much the efficiency of gas supply. He put forward the suggestion as a practical one for the future. He looked upon it as a method of making certain that the gas industry would be put on a standard basis. As to Mr. Milne's question relative to service pipes, he felt that the proprietor should pay for that portion of piping laid on private ground. As indicated in the paper, he advocated that the work of maintenance should be subsequently carried on by the gas department. So far as Alloa was concerned, they had not carried out any such scheme in a wholehearted manner; but he had ventured to put the proposition forward as one worthy of consideration and acceptance by the officials of gas undertakings. Personally he hoped that the early future would see such a change in the affairs of gas supply as he had endeavoured to outline in his paper.

"B.C.G.A." North Wales and Cheshire District Conference.—Under the Presidency of Sir John M. Frost (Chairman of the Chester United Gas Company), a British Commercial Gas Association District Conference is to take place next Wednesday (April 29), in the Assembly Rooms, Newgate Street, Chester. The Mayor (Alderman David Lythall Hewitt, J.P.) will welcome the delegates; and there will be luncheon at the Grosvenor Hotel, and a visit after tea to a local gas exhibition. For the business sessions there will be an address by Mr. W. M. Mason, and papers by Mr. Owen Evans (Engineer and Manager to the Wrexham Gas Company), Mr. D. Rennet, M.B.E., M.D., D.P.H. (Medical Officer of Health to the City and County Borough of Chester), and Mr. Harold Hartley, D.Sc.

Tar Plants.—A "T.I.C." (lead) tar dehydrating plant supplied by the Woodall-Duckham Vertical Retort and Oven Construction Company, Ltd., has just been put into operation at the works of the March Gas Company, and is, we understand, working very satisfactorily. Orders have also been received by the Woodall-Duckham Company for bitumen and tar mixing plants from the City and Royal Borough of Dunfermline Gas Department, the Gas Department of the Alloa Town Council, and the Dundee Corporation Gas Department. The production of Road Board tar and bitumen tar mixtures by the gas undertakings of Scotland is being taken up with a considerable amount of enthusiasm, as the profits to be gained in the production of such materials by the gas undertakings themselves are considerably greater than those obtainable from the sale of crude tar.

GASHOLDERS: THE USELESS TOP LIFTS.

By Norton H. Humphrys.

The subject of storage capacity as compared with the output of gas, though prominent in the early days of our industry, is now rarely heard of. The output of gas has tended to spread evenly over 18 hours out of the 24, thus diminishing the degree of variation in the gasholder contents. The difference between maxima and minima, once over 50 p.ct. of the daily output, is now a mere trifle, perhaps not exceeding 10 p.ct.

Night work tends to increase, even in small towns; and frequently the consumption keeps step closely with the make, with the exception of a slight gain between midnight and 6 a.m. Accumulated experience is such that a temporary stoppage of the make, due to obstruction or other trouble at some point between the retorts and the gasholders, is practically unknown to the younger generation of gas engineers. Modern manufacturing plant is more extensive in variety, more reliable, and more elastic as regards rate of production of gas, than the 9 ft. horizontal retort which at one time was exclusively used. The continuous vertical retort and the cupola type generator enable the production to be kept nearer in line with the output. This state of things is a great advance on the time when the bulk of the consumption came between dusk and 11 p.m., and troubles due to pitch, naphthalene, and frost were part of the regular winter experiences—to say nothing of fog and November afternoons. From motives of economy in first cost, the manufacturing and purifying plant at the smaller class of works then consisted to a large extent of cast-off plant from the larger—often antiquated and inefficient in pattern, or as much a misfit as "father's old clothes."

Hence the remarkable fact that the obsolescence of about half the storage capacity, due to its not being equal to the pressure demands at the governor outlet, has been accepted with indifference. In order to comply with the pressure clauses included in the Gas Regulation Act, 1920, not less than 40-10ths is needed; but the usual top or single lift pressure is in the neighbourhood of 30-10ths. Sometimes boosters are put down with the view of meeting this defect; but the majority have not experienced any inconvenience, and have scarcely noticed the difference. The established rule of storage capacity—*i.e.*, total holder delivery content equal to 24 hours' maximum output of gas—was perfectly sound when applied to the conditions under which it originated, but is quite out of tune with modern requirements. Many gas-works have 100 p.ct. total holder content in accordance with this rule, but only 50 p.ct. of available storage capacity that can be distributed under at least 40-10ths pressure.

A fair representation of the average state of affairs at a gas-works supplying 100 to 125 million c.ft. of gas per annum is three holders, respective capacities 100,000, 200,000, and 400,000 c.ft.—a total of 700,000 c.ft. of gas—approximating to the above rule. These were in every respect efficient up to within the last twenty years or so. As late as 1895, in the course of a paper read before the Incorporated Gas Institute, entitled "Unaccounted-for Gas," Mr. D. Irving accurately voiced the current opinions among gas engineers by the statement that, if the district requirements could not be met with 18-10ths pressure at the governor outlet, enlargements of some of the mains should be considered. At that date, single-lift holders were more in evidence, and took a large share in the work of distribution; but to-day we shall not be far wrong in stating that the bulk of the work falls on multiple-lift holders. All subsequent enlargements or additions have been supplied with not less than two lifts; but in the above example only 300,000 out of 700,000 c.ft. of gas is available at full pressure.

At first sight one might conclude that top or single lifts can be used for 8 or 10 hours out of the 24. Stated in terms of hours, this is 33 to 40 p.ct. of the whole; but measured by the proper standard—thousands of cubic feet of gas—the proportion is nearer 4 p.ct. A more important difficulty is that the top lift takes precedence of the lower ones. They cannot be brought into active service unless the top lift is full. If the lower lifts could be worked independently, the position would be different. Unless the make does, or can be made to, outstrip the output, which is very improbable, the effect of starting (say) at 6 a.m. with the top lift half-empty will be a deficient supply until the top lift is again clear above water, which may not be possible until after the following midnight. Consequently many multiple-lift holders in use to-day have not had the first cup under water for months, and perhaps years. Yet no deviation is noticeable from the beaten track, and holders are being designed and erected on the old lines of a pressure of about 30-10ths off the first, and an additional 20-10ths as each succeeding lift cups. So far from a reduction towards the 1895 18-10ths, distribution pressures are being increased to such an extent that before long the second lift may be as inefficient as the first is at present. It is difficult to see where the engineer would be prejudiced, if his 700,000 c.ft. storage were replaced by 300,000 c.ft. under not less than 50-10ths pressure.

An example of the possibility of working efficiently with a small storage factor is furnished by an 80 million c.ft. gas-

works. The holder capacity (total) was ample, but chiefly concentrated in one 90 ft. double lift; the only addition being a 60 ft. double lift, the lower half of which represented less than 10 p.c. of the 24-hour output. The tank of the large holder leaked badly, and during twenty years the amount expended in pumping approached the original cost of the holder. Two successive managers held that the loss was unavoidable, as the holder could not be put out of action for a time sufficient to repair the tank without practically shutting-down the works. A third manager thought he could tackle the problem, although he had only old pattern 9-ft. ⏢ section retorts in the retort house; and he succeeded in maintaining an efficient service for six weeks with the large holder out of action. No specific complaint was received at the rental office, and outside the works there was no knowledge of any special matter in progress. The carbonizing account for the year showed no extraordinary increase.

There is no reason to suppose that this experience is unique; and doubtless similar examples might be quoted in proof of the fact that an efficient supply can be maintained on a storage capacity much less than 50 p.c. of the 24-hour output. This means that the cost of gasholders, the effect of which on the selling price of gas has been a matter of frequent comment, can be substantially reduced, not in the same proportion per 1000 c.ft. capacity, but to a degree sufficient to exercise important effects on the selling price of gas by reducing the capital outlay per million c.ft. of gas made per annum. Smaller holders mean not only lower first cost, but reduced annual expenditure for maintenance and upkeep.

That useless top lift should therefore be abolished, if it cannot be brought into useful service, by some system of loading. If of no use, it certainly is no ornament, and sometimes an objection to neighbouring residents. A time has arrived when the whole question of storage, the safe or necessary working margin, and methods of construction, especially in reference to pressure capabilities, might be fully examined. Some years ago it was the custom to enlarge on the advantages of a 24-hour storage; but with the levelling-down of the demand towards one even hourly rate on the one hand and increased elasticity of manufacturing plant on the other, the need for such provision is steadily disappearing. The suggestion that high-pressure reservoirs might efficiently replace the bulky and costly gasholder is not so absurd as it seems at first sight. Perhaps some daring engineer will bring out a scheme for dispensing with storage by methods of adjusting the make to fit the demand.

REGENERATION OF COMBUSTION GASES.

[A Communication from the Karlsruhe Gas Institute, "Das Gas- und Wasserfach," Feb. 7, 1925.]

The proposal has recently recurred that a proportion of the combustion gases in producer practice might be withdrawn as they enter the recuperator, and that, instead of steam, gases containing carbon dioxide should be introduced with the combustion air under the producer grate. It is suggested that a considerable economy in fuel can be effected in this way. As this proposal is continually coming up from one quarter or another, the Gas Institute decided to probe it thoroughly once and for all, and to clear up the facts.

Let it be assumed first that half of the combustion gases are withdrawn, that is, 1 cub.m. out of 2 cub.m. of waste gases, and that this is returned under the grate together with 1 cub.m. of air; then the process is as follows:

In the combustion gas there are about 4 cub.m. N_2 to 1 cub.m. CO_2. If this CO_2 is used to take up carbon from the solid fuel, then 0·536 kg. of carbon can be gasified per cub.m. CO_2, and 2 cub.m. CO formed.

$$C + CO_2 + 4\,N_2 = 2\,CO + 4\,N_2 - 1731 \text{ calories.}$$

There are, therefore,

Taken from the producer	− 1731 calories
Developed in the settings	+ 6068 ,,
	4337 calories

The heat developed in 1 cub.m. CO_2 is thus passed from the producer to the settings, with the formation of 10 cub.m. of waste gas (2 cub.m. CO_2 + 8 cub.m. N_2). If, instead, the producer temperature is lowered in the usual way by the introduction of steam, the reaction, again theoretically, is

$$C + H_2O = CO + H_2 - 1267 \text{ calories.}$$

To produce the same cooling effect in the producer, however, the decomposition of $\frac{1731}{1267} = 1{\cdot}37$ cub.m. of steam can be assumed.

$$1{\cdot}37 \times [(CO + H_2) + O_2 + 4\,N_2] = 1{\cdot}37 \times [CO_2 + H_2O + 4\,N_2 + 3034 \text{ cal.} + 2570 \text{ cal.}]$$

Therefore there are developed in the settings

$$1{\cdot}37 \times (3034 + 2570) \text{ cal.} = 7677 \text{ cal.}$$

with the formation of combustion gas

$$1{\cdot}37\,CO_2 + 1{\cdot}37\,H_2O + 4 \times 1{\cdot}37\,N_2,$$

or a total of 8·22 cub.m. waste gas. For 1000 cal., therefore, which are withdrawn from the producer, there are developed in the oven

By waste-gas regeneration, 3500 cal. with 10 cub.m. combustion products.
By steam decomposition, 4430 cal. with 8·22 cub.m. combustion products.

From which it appears there is no advantage in the regeneration process, but rather the contrary.

It is, however, claimed that the method effects a saving of 10 to 15 p.c. of fuel in the grate, corresponding to the heat which is brought back under the producer in the waste gas—and this without any change in the final quantity of waste gas and its heat content. The whole cycle may, therefore, be followed out mathematically.

Of 2 cub.m. of waste gas, assume that one-third is withdrawn and returned to the producer together with 1 cub.m. of air.

1 cub.m. air + 0·66 cub.m. waste gas	
0·2 × 0·66 CO_2	= 0·132 CO_2
0·8 × 0·66 N_2	= 0·528 N_2
0·8 × 1 N_2	= 0·800 N_2
0·2 × 1 O_2	= 0·200 O_2
1·660 producer air.	

Heat contents of producer air (waste gas at 1000° C.)

0·132 × 1000 × 0·511	= 67·5
0·528 × 1000 × 0·332	= 175·3
1000 × 20 × 0·312	= 6·2
	249·0 cal.

Heat changes in producer

0·132 (CO_2 + C = 2 CO) × (− 1731)	= − 228 cal.
0·1 (2 C + O_2 = 2 CO) × (+ 1303)	= + 260 ,,
0·1 (O_2 + C = CO_2) × (+ 4337)	= + 434 ,,
	466 cal.

At the outlet of the producer there are therefore available

$$249 + 466 \text{ cal.} = 715 \text{ cal.}$$

Composition of the producer gas

0·264 cub.m.	CO	24·5 p.c.	CO
0·2 ,,	CO		
0·1 ,,	CO_2	5·3 ,,	CO_2
1·328 ,,	N_2	70·2 ,,	N_2
1·892		100·0	

Theoretical temperature of the producer gas

$$\frac{715}{0{\cdot}1 \times 0{\cdot}514 + 1{\cdot}792 \times 0{\cdot}333} = 1100° \text{ C.}$$

Combustion of the Producer Gas

Producer Gas.	Air Required.		Combustion Products.	
	O_2	N_2	CO_2	N_2
0·1 CO_2	..	..	0·1	..
0·464 CO	0·232	0·928	0·464	0·928
1·328 N_2	..	..	..	1·328
1·892	..	..	0·564	2·256
	1·160 air.		2·820 waste gas.	

The result, therefore, is 2·82 cub.m. of waste gas instead of 2·0 cub.m. Of this, 0·66 cub.m. would be introduced under the producer, and the remainder, 2·14 cub.m., will be required to preheat 1·16 cub.m. of air.

There is available for the oven

1. The heat of the producer gas	715 cal.
2. The combustion heat 0·464 × 3031	= 1410 ,,
3. The heat of the combustion air (900° C.)	
1·16 × 900 × 0·33	= 345 ,,
	2470 cal.

Extreme temperature of the combustion

$$\frac{2470}{0{\cdot}564 \times 0{\cdot}562 + 2{\cdot}256 \times 0{\cdot}358} = 2200° \text{ C.}$$

Heat content of waste gases at 1000° C.

0·564 × 0·511 × 1000	= 288 cal.
2·256 × 0·332 × 1000	= 726 ,,
	1014 cal.

The heat available for the settings is, therefore,

$$2470 - 1014 = 1456 \text{ cal.}$$

With this regeneration of one-third of the waste gases, the expenditure of carbon for the heat production may be calculated as follows. In the producer gas there are 0·564 cub.m. of gases containing carbon. The quantity of waste gas used introduces 0·132 cub.m., so that there are produced 0·432 cub.m., and 0·432 × 0·535 = 0·232 kg. of carbon, which is, therefore, the quantity required for 1456 cal. in the combustion chamber. This, with a calorific value for the carbon of 8100 cal., represents 0·232 × 8100 = 1880 cal.

For 1000 cal. in the combustion chamber, therefore, 1290 cal. in the coke are consumed.

With this must now be compared the conditions when the

lowering of the producer temperature is effected by decomposition of steam instead of waste gas.

PRODUCER GAS WITH STEAM DECOMPOSITION.

An equal total calorific value of the producer gas must be assumed. In the previous example, 1·892 cub.m. contained 0·464 cub.m. of CO, or, with the regeneration of the waste gases, 1410 cal. Taking a water gas of the following composition

CO_2, 5 p.ct.			
CO, 28 ,,	. . . . .	0·28 × 3034 =	850 cal.
H_2, 10 ,,	. . . . .	0·10 × 2570 =	257 ,,
N_2 57 ,,			

the calorific value is 1107 cal. per cub.m.

The composition of the assumed producer gas is correct, since for 57 volumes of N_2 there are 14 volumes of O_2. Of these, 5 volumes are used to form CO_2, leaving 9 which may form 18 CO. There remain 10 CO, which, together with 10 H_2, have been produced by the reaction

$$C + H_2O = CO + H_2.$$

In order that the same calorific value as before may be available with this producer gas of 1107 cal. per cub.m.—*i.e.*, 1400 cal.—1·28 cub.m. of semi water gas must be produced, thus

0·064 cub.m.	CO_2
0·358 ,,	CO
0·128 ,,	H_2
0·730 ,,	N_2
1·280 cub.m.	

the formation of which produces

0·064 ($C + O_2 = CO_2 + 4337$ cal.)	= + 278 cal.
0·128 ($C + H_2O = CO + H_2 - 1267$ cal.)	= − 162 ,,
0·230 ($C + \frac{1}{2} O_2 = CO + 1303$ cal.)	= + 300 ,,
	+ 416 cal.

Heat contents of the steam (assuming 50 p.c.t. excess)

$$\frac{0·192}{0·8} \times 639·7 = 153·5 \text{ cal.},$$

or preheating the primary air to 400° C.

$$\frac{0·73 \times 100}{80} \times 0·320 \times 400 = (117 \text{ cal.})$$

So that at the outlet of the producer there are available

I. 416 + 153 = 569 cal. without preheating of air.
II. 416 + 153 + 117 = 686 cal. with preheating.

From which the temperature of the gas may be found as

I. $$\frac{569}{0·064 \times 0·524 + 0·128 \times 0·335 + 1·088 \times 0·338 + 0·064 \times 0·410} = 1230° \text{ C.}$$

II. $$\frac{686}{0·064 \times 0·530 + 0·128 \times 0·338 + 1·088 \times 0·341 + 0·064 \times 0·419} = 1420° \text{ C.}$$

Air and Combustion Products.

Producer Gas.	Air Required.		Combustion Products.		
	O_2.	N_2.	CO_2.	H_2O.	N_2.
CO_2 0·064 . . .	..	..	0·064	..	..
CO 0·358 . . .	0·179	..	0·358	..	..
H_2 0·128 . . .	0·064	..	..	0·128	0·730
N_2 0·730 . . .	..	0·972	..	0·064	0·972
	0·243	0·972	0·422	0·192	1·702
	1·215 cub.m. air		Waste gas, 2·316		

Heat contents of the combustion air at 900° C.

$$1·215 \times 0·329 \times 900 = 360 \text{ cal.}$$

Available for the oven

Heat of the producer gas	569 cal.
Combustion heat of the producer gas	1410 ,,
Heat of the combustion air	360 ,,
	2339 cal.

Extreme temperature without preheating the air

$$\frac{2339}{0·422 \times 0·508 + 0·192 \times 0·506 + 1·702 \times 0·362} = 2425° \text{ C.}$$

Extreme temperature with preheating the air

$$\frac{2456}{0·422 \times 0·570 + 0·192 \times 0·517 + 1·702 \times 0·364} = 2530° \text{ C.}$$

Heat contents of the combustion products at 1000° C.

0·422 × 0·511 × 1000 =	216 cal.
0·192 × 0·398 × 1000 =	76 ,,
1·702 × 0·332 × 1000 =	565 ,,
	857 cal.

Therefore there are available for the settings

2339 − 857 = 1482 cal. in case I.
2339 + 117 − 857 = 1599 cal. in case II.

The consumption of carbon is

$$0·422 \times 0·536 = 0·226 \text{ kg.}$$

Taking the calorific value at 8100 cal. per kg., this makes 1830 cal.

For 1000 cal. in the combustion chamber, therefore, there are required in case

I. 1230 cal. from the coke.
II. 1145 ,, ,, ,, ,,

Finally, the heat available in the waste gases must be estimated, as being employable up to 300° C. for steam raising. In all, taking the regeneration process first, there are 2·820 cub.m. of waste gas, of which 0·66 cub.m. is returned to the producer for regeneration. This leaves

2·160 cub.m.—0·432 cub.m. CO_2 and 1·730 cub.m. N_2.

Heat contents of this at 1000° C.

0·432 × 0·511 × 1000 =	221 cal.
1·730 × 0·332 × 1000 =	575 ,,
	796 cal.

At 300° C.

0·432 × 0·442 × 300 =	57 cal.
1·730 × 0·318 × 300 =	165 ,,
	222 cal.

Difference 796 − 222 = 574 cal.
For preheating air to 900° C. are required

$$900 \times 0·33 \times 1·16 = 314 \text{ cal.}$$

Leaving for steam raising 230 cal.

In the steaming process, the waste gases at 1000° C. contain

0·422 × 0·511 × 1000 =	216 cal.
0·192 × 0·398 × 1000 =	76 ,,
1·702 × 0·332 × 1000 =	565 ,,
	857 cal.

And at 300° C.

0·422 × 0·442 × 300 =	56 cal.
0·192 × 0·376 × 300 =	22 ,,
1·702 × 0·318 × 300 =	162 ,,
	240 cal.

Difference 857 − 240 = 617 cal.
For preheating air to 900° C. are required

$$1·215 \times 0·33 \times 900 = 360 \text{ cal.}$$

Total available for steam raising	257 cal.
Required for producer steam	153 ,,
Remaining for other steam raising	104 cal.

Summary.

	Heat Changes in the Producer.	Temp. of Gas Produced.	Available for Oven when Waste Gas at 1000° C.	Extreme Temperature of Combustion	Calorie Consumption of Coke per 1000 Cal. in Oven.	Free Available Waste Heat.
With waste-gas regeneration . .	+ 466	1100° C.	1456 cal.	2200°	1290	230
With ordinary steaming	+ 416	1230° C.	1482 ,,	2425°	1230	104
Do. with air preheating to 400° C. . .	..	1420° C.	1599 ,,	2530°	1145	..

Hence a detailed calculation of the heat processes involved in the regeneration of waste gases from a producer, as compared with ordinary steam injection, shows that no actual advantage is gained by the former method.

Preventing Corrosion.

The belief is expressed by Mr. R. B. Williams, writing in the "Gas Age-Record," that a remedy for wasteful and costly rust will be discovered, now that the problem is being attacked vigorously, and from many angles. He points out the economic importance of the problem to the gas industry, whose tremendous advancement will call into use a vastly increased amount of metallic surface. Even now, he says, metallurgists are learning to incorporate with iron a proportion of chromium; and when this proportion amounts to from 12 to 18 p.ct., a rustless iron results which is capable of taking a high polish, and is absolutely impregnable, not only to ordinary atmospheric influences, but even to such powerful corrosive elements as boiling sulphuric acid. Unfortunately, while chromium is not a rare element, it is sufficiently uncommon to make the cost of high-chromium steel prohibitive for ordinary usage. It has been found also that the incorporation of 0·5 p.ct. copper into iron will materially increase the resistance of the resultant metal to corrosive agents. Investigators are collecting more and more information on the causes of corrosion, and more and more material for the development of protective coatings or paints. One railroad, as an instance, has recently found that, by applying a certain protective covering, a marked decrease in corrosive tendency on rails results. Prof. Baker, of the University of Michigan, has discovered a method whereby steel can be electro-plated to a thickness of 0·001 in., instead of the usual 0·0001 in., at very little additional expense. This extra thickness of the nickel-plating affords a protective covering to the base metal that capably resists the test of the United States Bureau of Standards.

SCOTTISH JUNIOR GAS ASSOCIATION.

(EASTERN DISTRICT.)

Annual General Meeting.

The Annual Meeting of the Association was held on Saturday, April 11, in Edinburgh—Mr. R. L. Laing (Brechin), resident, in the chair.

The Hon. Secretary and Treasurer (Mr. E. L. Farquhar, Lower Largo) read the annual report of the Council for the 1st session, which stated that eight members had been added to the roll during the session; the total membership now being 17 ordinary members and 16 honorary members. The financial statement submitted showed that at the end of the year there was a credit balance of £50 4s. 11d.

On the motion of Mr. Laing, seconded by Mr. Gavin Galashiels), it was unanimously decided to devote a sum of money not exceeding £20 for the purpose of bringing the Association library up to date.

Mr. Farquhar intimated that he had decided not to stand for re-election, as he felt that his duties at Largo did not afford him sufficient leisure to devote to Association affairs.

The President remarked on the smoothness with which the business had been carried out during the two years Mr. Farquhar had been in office. The membership had been increased by 25, and the credit balance from £16 to £50.

The following office bearers were thereafter elected for the ensuing session :

President.—Mr. Alan Clark, Perth.
Vice-President.—Mr. H. A. Yuill, Dundee.
Hon. Secretary and Treasurer.—Mr. J. Scobie, Dunfermline.
Council.—Messrs. Carrie, Duffy, and Gavin.
Auditors.—Messrs. J. R. Moyes and J. M'Donald.

With a view to bringing the matter before members, a letter was read from the Institution of Gas Engineers intimating that a register was being prepared for the assistance of those members of the Institution out of employment.

Mr. Laing then delivered his

PRESIDENTIAL ADDRESS.

I have to thank you for the honour conferred upon me by electing me your President—an honour which I feel is considerably enhanced by the fact that during the current session our Association has attained its majority.

Education.

At present we are very much concerned with education; and I assume that we are agreed that this question in its broadest sense must be kept strictly in the foreground. The Institution of Gas Engineers have laid down a thorough and complete programme which coming gas engineers must follow. The question, however, which is really concerning many of us is how we are to study to the best advantage the subjects prescribed. I am in hearty agreement with the whole scheme, but am convinced that the lack of technical centres of education in the country generally and in this district in particular makes the further education of the gas engineer a problem rather difficult of solution. The average continuation classes in small burghs cannot reasonably be expected to provide facilities for such specialized instruction, where the enrolment must of necessity be small. Reliable guidance to the student with regard to the choice of subjects is a feature which is calculated to make for success. It may be argued that to men of our nationality the problem should present no insuperable difficulty; but until some scheme of suitable curriculum in our technical schools and classes is evolved, and a Director of Gas Education is appointed, there must be a considerable waste of time and energy on the part of the student. The greatest good for the greatest number cannot be obtained by prescribing a highly specialized scheme, and at the same time offering no suggestion as to the best means of carrying the scheme to a successful issue. I am glad to learn that an Advisory Committee for Scotland have been appointed; and I am sure they will do much to advance our claims for recognition in this direction, and put us on a better footing than originally arranged for. We could derive more benefit from an educative point of view from this Association if we maintained a more vigorous campaign of papers and discussions.

Carbonizing Plant at Brechin.

The installation is of the Woodall-Duckham type, and consists of two parallel benches of three retorts, regenerators, &c. The retorts are 25 ft. long, tapering from 3 ft. 4 in. by 8 in. to 2 ft. 4 in. by 20 in. at the bottom. The whole plant is capable of carbonizing 21 tons of coal a day—in six retorts of 3½ tons. This throughput can be altered, and it is possible to vary the make per mouthpiece considerably as occasion may demand. At present we have an average output of 62,000 c.ft. per retort per day. The average amount of coke produced is 13 cwt. per ton of coal carbonized; and of this amount, 30 p.ct. is generally required for the producer. This percentage varies according to the numbers of retorts working. On the average, the actual amount of coke for sale is just over 9 cwt., which, with the reduction of breeze, is reduced to nearly 8 cwt. Our net saleable coke figure is 5·9 cwt. This is coke actually leaving the works; the balance being used for steam raising. All coke is sieved through a 1-in. mesh before going to the producer, and is handled by the stokers themselves.

The coal is brought into the coal store by carts, is filled into hutches of 10 cwt. capacity, and elevated to the storage hoppers by a steam-driven lift. The hoppers are so arranged that they hold a three-day supply; and by keeping all the hoppers full, we are assured of a six-day supply. The stokers handle no coal. Two yardmen are engaged from 1½ to 2 hours every morning to fill the storage hoppers; and the lift is used afterwards for elevating coke.

Working Results.

Some figures regarding the work done by the plant may prove interesting. The retorts were put to work in July, 1920; and since then our annual make has risen from 41 to 47 millions. The cost of repairs and renewals to date has been £19, which figure includes the conversion of hydraulic to dry seals at the top of the retorts. The remainder is all for bottom ironwork, side bottom plates, and curved door plates which were eaten through by the action of the water and coke. This ironwork was renewed last summer. The brickwork of the retorts, beyond showing a slight picking of the joints round the bottom, is in excellent condition. The materials used were Glenboig. No bulging appears at any part. So far, three retorts only have been in action; and the following figures represent four years' working. The total amount of coal carbonized has been 107,400 tons—an average of 3571 tons per retort. For the same period, the gas (460 B.Th.U.) per ton of coal has been 16,405 c.ft., sulphate of ammonia 26·79 lbs., tar 18·86 gallons, and coke (net for sale) 5·5 cwt. We steam at 15 lbs. pressure; and the original steaming arrangement was altered to one of our own design. With the present system there is no trouble in disconnecting the superheater, and no danger in burning-out during scurfing operations. The present tubes have been doing duty for 2½ years, with no repairs. The retorts are run for twelve weeks without scurfing; and we are in favour of periods not exceeding this. Clean retorts promote steady working, regular coal feed, and consequently a straight line on the calorimeter record.

Indicators are fitted to each auxiliary coal hopper, which can be read at floor-level. There is then no excuse for short or extra coal feed. The attendant is able to watch the working of the retorts without having to climb to the top of the bench. I would certainly recommend this indicator system for small installations. It is not an expensive item, and certainly repays itself in better results and saving of labour. The producer has given us little trouble except with the accumulation of dust and very small breeze at the back wall. If this layer is not attended to, it becomes black and dead, and reduces the area of the producer to a considerable extent. This trouble has been largely overcome by introducing an additional firebar about 18 in. deep, two steps up, which enables the stoker to get right through to the back of the grate, and keep the whole fire always on the move. The producer is pricked-up every four hours, and clinkering is only done at long intervals, much depending on the class of coke in use. In working vertical retorts of the type and size with which I am acquainted, I would summarize the main features of good practice as follows :

(1) Scurf at regular intervals.
(2) Steady make per retort.
(3) Periodical attention to flues, regenerator, and producer.
(4) Ample chimney pull.
(5) Strict attention to exhauster vacuum and retort-house governor.
(6) Interest in the workmen directly connected with the retort house.

A comparison between the first and fourth year's working is interesting :

—	1920.	1924.
Gas manufactured	41,129,600 c.ft.	46,408,000 c.ft.
Coal carbonized	2,787 tons	2,665 tons
Gas made per ton of coal	14,757 c.ft.	17,413 c.ft.
Price of coal per 1000 c.ft. made	1s. 9·9d.	11·59d.
Labour	10·66d.	8·01d. (includes distribution, sulphate of ammonia, &c.)
Carbonizing costs only	5·01d.	3·24d.
Residuals realized	1s. 5·90d.	1s. 0·63d.
Coal per ton in works	46s. 9·6d.	31s. 11·1d.
Calorific value of gas	475 to 460	430 to 440
Price per 1000 c.ft.	6s. 8d.	4s. 7d.
Cost of repairs (per 1000 c.ft.)	..	·03d.

As will be observed, our present calorific value is given as 430 B.Th.U.; but in the absence of a total heat calorimeter, and running constantly with the Beasley recorder, I am not claiming this figure with absolute certainty. Two jet photometers are installed in the retort house—one in direct connection with the purifier outlet and placed in a convenient position in the retort house. The gas which is passing from the retort can thus be seen burning 30 to 40 minutes later at the photometer; and a change in calorific value can be immediately investigated. Gas of a steady calorific value is at all times our ideal; and with

attention to the points enumerated, and strict observance of retort house conditions, stokers themselves find an interest in keeping a straight line on the chart. Further to help to nullify any discrepancy in calorific value which may take place in the supply to the district, all the gas made is led into the largest holder, and fed back into the smaller as the consumption demands.

At the introduction of vertical retorts, with which in our case a reduction of the calorific value of the gas was made, it was necessary to survey the distribution system. The change-over was made at an opportune time—viz., the middle of June. We were thus enabled at first to give full attention to cooking apparatus, and gradually deal with the lighting and heating appliances as the load came on. We were aware that portions of the town mains were requiring attention; work was commenced immediately. For some time we were engaged laying new steel mains and extending and renewing services. Now, at the most distant point from the works, we are able to maintain ample pressure. We are in the fortunate position of having our works at the lowest part of the town, and have no difficulty, with a works pressure of 30-10ths, in providing a pressure of 2 in. at the consumers' meters 1½ miles from the works, when the heaviest load is on. We have laid over 5000 yards of steel main ranging in size from 1½ in. to 4 in. diameter.

As road construction has been everywhere carried out extensively in Brechin, we took the opportunity of examining and, if necessary, increasing services and mains. All steel mains are of the spigot and faucet type, with lead joints. Nothing smaller than ¾ in. service is laid. Most services are taken from the side of the main with heavy brass couplings; and in the case of a short service (anything up to 12 or 15 ft.) lead pipe is used. Where there is a long run, galvanized tube of steam quality is installed. This is excellent, for there is less corrosion. Our distribution system also includes seven miles of steel main supplying high-pressure gas to a neighbouring village. As this main runs for nearly a mile through part of the town, we have utilized it to a fair extent for supplying various large consumers in the town. We boost at 60 in. with a Bryan Donkin compressor, and all high-pressure regulators are by the same firm. The system works perfectly.

Strict investigation of meter inspectors' reports helps at all times. Cookers are loaned free provided a certain amount of gas is consumed per annum, and they can also be had on the hire-purchase system. Gas fires and radiators are all hire-purchase, but every encouragement in the way of price is given for an outright sale. There are 2630 consumers; the average consumption per consumer being 17,000 c.ft. for ordinary, and 15,000 c.ft. for prepayment, meters. Since 1914 the number of consumers has increased by 330, and the annual make has risen from 30 to 48 millions—and this despite a decrease in population of nearly 16 p.ct.

I would here make a slight reference with regard to competition with electricity, and relate briefly what has been happening during the last few years in our city.

Electricity at Brechin.

The electricity supply was originally under an Order of 1898, granted to the Burgh of Brechin; and in 1900 a deed of transfer approved by the Board of Trade transferred the Order to a private company. The Order of 1898 allowed a maximum price of 8d. per unit, with a minimum charge of 13s. 4d. per quarter. From 1900 until 1914 the price ranged about 6d. per unit; and it was not until 1919 that the maximum price of 8d. per unit came into force. Then in 1920, under the Temporary Increase of Charges Act, the Company were granted an Order to charge a maximum of 1s. per unit for lighting, and a minimum charge of 15s. during the winter quarters, and 10s. during the summer quarters. From 1900 until 1919 competition was keen; but it was not until four years after this minimum charge had been adopted that the Electricity Company were able to pay a dividend, when their profit rose from £600 to £2000. Naturally the increase in price, and especially the minimum charge, did not find favour. A public meeting of protest was called, and subsequently an inquiry was held by the Ministry of Transport. One consumer giving evidence at the inquiry said he had paid £2 for four summer quarters, and consumed 16 units, so that he was paying at the rate of 2s. 6d. per unit. All this controversy and dissatisfaction brought us many consumers; a goodly proportion of them being shopkeepers. We have been able to convince them that gas as an illuminant is equal to electricity. As regards costs, with electricity at 1s. 5d. per unit, the majority of new consumers have halved their previous lighting bill. That gas for cooking and heating holds the field, no one will dispute.

Mr. Clark proposed a vote of thanks to the President.

Mr. Laing thanked the Association for the way in which they had supported him during his term of office.

Thereafter the members joined their lady friends at tea, following which an enjoyable whist drive and dance completed a successful meeting.

"Journal" Index.—The index to the "Journal" for the past quarter—January-March—is given as a supplement to this issue.

POWER ALCOHOL.

Production from Tuber and Root Crops in Great Britain.

As a fuel, alcohol possesses many advantages, perhaps th chief of which is that it allows the use of high compressions, t to 200 lbs. per sq. in. On the other hand its volatility is lov and consequently it is necessary to add a more volatile "liver ing agent." It does not mix freely with petrol, so that th latter is in this respect ruled out of court. It is, howeve miscible with benzole in all proportions, and the resulting mi ture is a highly efficient fuel. Every day one hears of the nece sity for finding a substitute for imported petroleum product Benzole is as good as, if not better than, petrol as a moto fuel; but the supply is by no means equal to the demand. seems possible, therefore, that, if alcohol can be produce cheaply in Great Britain, the standard home-produced fuel the future may be a benzole-alcohol mixture.

Alcohol from Potatoes.

For several years before the war, Germany produced larg quantities of alcohol from potatoes specially cultivated for th purpose. The history of this German industry is comprehen sively given in "Power Alcohol," by G. W. Monier-Williams He points out that the success attained prior to the war wa due not so much to actual cheapness of production as to th effect of State subsidies. If we can draw conclusions fro continental experience, the cultivation of potatoes in Gre Britain, with the object of producing power alcohol, would de mand heavy subsidies, and would not, under present condition be economically practicable. It is significant that, before th war, 95 p.ct. of the alcohol produced in Germany was mad from potatoes, while in 1920-21 only about 15·5 p.ct. was s made.

Work of the Fuel Research Board.

The Department of Scientific and Industrial Research (Fue Research Board) have just published their Third Memorandu on "Fuel for Motor Transport," which is concerned with th production of power alcohol from tubers and root crops in Gre Britain. In this pamphlet (obtainable from H.M. Stationer Office, Adastral House, Kingsway, W.C. 2, price 9d. net) it i stated that the only possible raw materials which could b grown in Great Britain and Ireland for this purpose ar potatoes, mangolds, and Jerusalem artichokes. It is unlikel that potatoes could be grown at a price which would make i possible to obtain alcohol for use as an alternative to petrol a anything approaching its present price. Stated briefly, 1 to of potatoes produces 20 gallons of 95 p.ct. alcohol, so that ever £1 it costs to grow a ton of potatoes is equivalent to 1s. on gallon of alcohol for raw material. A possible way in whic alcohol might be produced for the purpose is suggeste —viz., co-operation between the potato grower and distiller, th erection of small distilleries in the centres of growing districts the combination of cattle rearing with potato cultivation so a to utilize the distillery residues for cattle feeding, and the us of the resulting manure on the land. The mangold possesse several advantages over the potato. It is an easier crop t grow, harvest, and store, and it is not so liable to disease an failure. Its carbohydrates, being in the form of sugar, simplif the manufacture of alcohol. It is, however, susceptible to in jury from frost, and cannot be grown in the north of Englan or in Scotland. The yield of 95 p.ct. alcohol per ton, calculate on the average sugar content, is about 8 gallons; so that ever £1 it costs to grow a ton of mangolds is equivalent to abou 2s. 8d. on a gallon of alcohol for raw material. The averag yield of mangolds per acre in Great Britain is, however, 1 tons, as against 5·7 tons of potatoes; and the price is abou £1 10s. for the former as against about £7 for the latter o the wholesale market. If potatoes were used, the cost pe gallon for the raw material would be 7s.; if mangolds, the cos would be 3s. 9d. The yields from Jerusalem artichokes var from 15 to 25 gallons of 95 p.ct. alcohol per ton.

Tempering Springs by Gas.

An account of the installation of a continuous-process ga oven for tempering the springs of automobile seats was give some little time ago in the pages of the "American Ga Journal." For these seats helical coil springs are turned ou in great quantities; but the wire used in the coils, after the have been formed, is too hard to be fitted in a seat, and to giv service, without the coils flattening, and so it becomes neces sary to resort to tempering. Immediately after being formed the coils are packed on perforated metal trays (each tray hold ing 40 lbs. to 50 lbs. of wire coils), and carried in a continuou line on gravity conveyors to the tempering oven, to which the are transferred. The oven temperature is maintained at 500 Fahr. Direct gas burners with blast tips, operating at 1 lb pressure developed by a Roots gas pump, are controlled auto matically by Robertshaw temperature controllers. With tw conveyors operating, the oven equipment accommodates 24 trays an hour, each holding 40 lbs. of coils, making a total o 9600 lbs. an hour delivered, or approximately 86,400 lbs. pe nine-hour day. The heat treating time is 15 minutes.

CORRESPONDENCE.

Government Subsidies.

Sir,—With reference to the possible subsidy by the Government to electricity undertakings, it would appear that the utmost vision has not been utilized. As the gas industry is the chief conservator of our coal supplies, would it not be better to subsidize this industry for the purpose of expanding its production of aniline dyes, and thus enable the gas undertakings of the country to engage chemists on research work with a view to our equal efficiency with Germany in regard to yes?

"Carboniferous."

April 17, 1925.

REGISTER OF PATENTS.

Regenerative Gas Furnaces.—No. 208,700

Huessener, K., of Pittsburgh.

No. 30,480; Dec. 4, 1923. Convention date, Dec. 21, 1922.

This invention relates to the regulation of combustion, and consists essentially in regulating apparatus wherein the air and gas are fed to the furnace through chambers connected to pressure-controlled mechanism. The latter regulates the supply of air and maintains the air and gas pressures inside the chambers at a constant ratio. A hand-controlled valve is provided in the air supply conduit between the air chamber and the furnace; this enabling the apparatus to be adjusted.

Gas-Fired Firetube Boiler.—No. 216,151.

Eickworth, R., of Dortmund.

No. 12,072; May 16, 1924. Convention date, May 16, 1923.

A single U-shaped firetube is used for heating the boiler; one of the two ends being provided at the front end of the boiler with a blade wheel burner, while the other end of the firetube is provided (also at the front end of the boiler) with a fan connected to the burner by gearing.

Coke Handling Plant.—No. 218,654.

Koppers Coke Oven Company, Ltd., of Sheffield.

No. 15,800; July 1, 1924. Convention date, July 5, 1923.

A method commonly adopted for handling coke from coke ovens consists in pushing the coke out of the oven into a car, then running this under a central quenching tower, and thence transporting the coke from the car to a screening plant by a conveyor. This invention relates to this system. In combination with an elevated storage bunker from which the screen can be fed is used an inclined chute below the bunker, delivering directly to the screen, so that the latter can be fed from the bunker or by the chute alternatively; the coke conveyor being arranged to deliver either to the inclined chute below the bunker, or to an inclined chute above the bunker. Under normal conditions the coke is delivered directly from the intermediate container to the bottom chute leading to the screen; but in the case of a stoppage at the screen, incoming coke is deflected to the bunker, whence it is delivered to the screen when convenient. Direct feed to the screen may proceed when the bunker is full.

Purification of Coke-Oven Gases.—No. 224,863.

L'Air Liquide Sté. Anyme pour l'Etude et l'Exploitation des Procédés Georges Claude, of Paris.

No. 18,793; Aug. 7, 1924. Convention date, Nov. 17, 1923.

By this process the carbon dioxide and sulphuretted hydrogen are removed from the gas by passing it through a column provided with Raschig rings through which an ammoniacal solution is circulated. This solution can afterwards be regenerated by passing it through a tower provided with plates in which it is subjected to a progressively increasing temperature sufficient to expel the carbon dioxide and sulphuretted hydrogen. Alternatively the solution may be distilled, and the ammonia evolved converted into sulphate.

Safety Cocks for Gas Burners.—No. 229,876.

Schar, F., of Schwechat, and Theumar, R., of Vienna.

No. 7182; March 20, 1924.

This invention relates to gas burners of the kind in which, as long as the burner is alight, the shutting-off member is retained in the open position by a flexible clamping device under the influence of the generated heat, but is automatically closed as soon as the burner is extinguished. According to this invention, a rod is arranged to move longitudinally between the burner and the outlet nozzle for the gas, the end of this rod which is near to the burner being attached to the clamping device, while the other end is so formed that it may be forced against the nozzle to close it.

Low-Temperature Carbonization.—No. 229,880.

Zuyderhoudt, P. C., of Brussels.

No. 7262; March 21, 1924.

The object of this invention is to provide an oven for producing continuously low-temperature coke in the form of cakes, and for recovering the distillates. An elevated ring oven is provided comprising a series of chambers each containing a battery of retorts and having means for connecting them with each other, with the outside air, and with a waste-gas flue. The chambers extend over a free space of a depth at least equal to that of the retorts. This is for discharging purposes. Discharge is effected by lowering the bottoms of the retorts. In operation the retorts are entirely surrounded by the heating atmosphere of the chambers.

Coke Ovens.—No. 230,167.

Mellersh-Jackson, W. J., of London.

(A communication from the Koppers Company, Ltd., of Pittsburg.)

No. 30,490; Dec. 4, 1923.

This invention relates to regenerative ovens with retorts alternating with heating walls containing vertical heating flues porting at their upper ends into horizontal distributing channels. The invention has for its chief object to permit a considerable reduction in the capacity of the latter channels, with corresponding increase in the effective heating area of the heating walls, while permitting the employment of the system of flow through the walls, wherein upflow in the vertical flues of one group takes place concurrently with downflow in the flues of another group in the same heating wall. A communication duct is located at a higher level than the retorts, and connects the horizontal distributing channel serving a group of upflow combustion flues with a horizontal distributing channel in the same heating wall and serving a downflow group of flues.

Wet Meters.—No. 230,175.

Thorp, F., and Parkinson and W. & B. Cowan, Ltd., both of Kennington, S.E. 1.

No. 30,619; Dec. 5, 1923.

This invention relates to wet gas-meters of the type wherein one or more oscillating liquid-sealed bells are coupled to a rocking lever or levers or other mechanism, and thus also to the gas distributing mechanism. The object is to ensure that operation of the meter shall be prevented should the liquid within the meter exceed a predetermined level.

There is provided an auxiliary valve upon a float-controlled stem which is closed to prevent a flow of gas when the liquid exceeds the predetermined level; and this auxiliary valve is mounted above and on the same stem as the ordinary stop valve.

Water Gas Production.—No. 230,217.

Whitwell, G. E., of Tacoma, Washington.

No. 966; Jan. 12, 1924.

This invention relates to a process of making water gas and to apparatus therefor.

According to the invention, part of the run is effected by passing a mixture of fresh gas-making steam and gas successively through a recuperating or superheating vessel or vessels and the entire fuel bed in the generator, and another part by steaming the entire fuel bed in the opposite direction. The run with fresh gas-making steam and gas preferably follows the blasting of the fuel bed and the up run of steam, and takes the place of the so-called down run of steam, which is expensive and wasteful through the steam of the customary down run not being superheated. The patentee further points out that the back run of steam and gas effected in accordance with his invention cleans the checker brick when oil is used, removing carbon deposit therefrom and increasing the yield of gas. The steam which passes successively through the superheating vessels and generator, produces gas; and a portion of this is repassed with steam through the vessels and generator, and forms, with the steam, the mixture of steam and gas above referred to. It is claimed that the invention decreases the cost of maintenance of the apparatus and permits the use of cheaper low-grade oils as the enriching material; further, that the generator be charged with other fuels than coke or anthracite.

The apparatus for carrying out the process above described includes a generator and a superheater or recuperator, and if desired a carburettor there-between; means being provided, including a device such as a jet, for causing a back run of gas through the apparatus. As in well-known gas-making plants, there is a main passage from the generator, through the superheating vessel or vessels, to a wash-box or the like. According to the present invention, a second passage is provided from the generator to the wash-box, these two passages having a by-pass connection with each other in which the steam jet is located, the by-pass preferably connecting with the main passage between the superheater and the wash-box, although it falls within the scope of the invention to connect this by-pass with the main passage at some other point.

After describing in detail the apparatus, the specification states that the act of recirculating the gas has a most important and beneficial effect upon the economical operation of the set in the manufacture of carburetted water gas.

First, a larger volume and weight of gases is passed through the superheater and carburettor than if steam alone were so passed, thereby transferring to the generator (where it can do useful work) heat contained in the superheater and carburettor otherwise wasted.

Secondly, when blue gas is passed a second time through the fire-bed, the carbon dioxide contained therein is afforded another opportunity to become reduced to the more valuable carbon monoxide.

Thirdly, the capacity of the machine is greatly increased. When steam reacts with incandescent carbon, two main reactions are possible according to the temperature and concentration of the reacting substances:

$$H_2O + C = CO + H_2.$$
$$2H_2O + C = CO_2 + 2H_2.$$

The first of these two is the one most desired in making carburetted water gas. Maximum capacity, among other things, requires maxi-

mum passage of steam. The amount of steam possible to be used, however, is limited by a further reaction:

$$H_2O + CO = CO_2 + H_2.$$

Too much steam, therefore, results in the formation of carbon dioxide, so undesirable as to limit the amount of steam usable and, with it, the capacity of the set. Recirculation of considerable portions of the back run gas permits of the use of excess steam and the attainment of increased capacity, because carbon dioxide formed is later reduced to carbon monoxide by again passing through the fire-bed and coming in contact with incandescent carbon—thus:

$$CO_2 + C = 2CO.$$

Fourthly, inasmuch as in any water gas set steam in excess of that theoretically required must be used, there is always an excess of steam which passes undecomposed through the fire-bed. Recirculation, however, provides for a repassage of some of this steam through the fire-bed, thus reducing the amount of steam which must be supplied from the boilers.

Fifthly, there is a reaction between the superheated back run steam and recirculated back run blue gas, whereby carbon dioxide is formed from the carbon monoxide of the blue gas. This reaction may take place either in the superheater or in the carburettor, or in both, before the gases reach the generator; thus:

$$CO + H_2O = CO_2 + H_2.$$

The carbon dioxide formed is later reduced to carbon monoxide by passage through the fire-bed. Because of this reaction, however, the gas-making portion of the set is thereby increased to include the carburettor and superheater as well as the generator, thus increasing the capacity of the set.

Washer-Scrubbers.—No. 230,243.

Kirkham, Hulett, & Chandler, Ltd., Hersey, S., and Stokes, F. W., all of Norfolk Street, W.C. 2.

No. 3427; Feb. 9, 1924.

This invention provides for a modified design of the well-known apparatus wherein bundles of metal plates are arranged between a pair of circular end or cover plates. The object of the modification is to increase the rigidity of the rotating members, to facilitate the carrying of wider bundles, providing increased washing area, to provide for the easy removal of the bundles for cleaning, and generally to reduce the cost of manufacture.

To this end, each bundle is mounted in a framework carried by a hub on the driving shaft in such a manner that the end plates of each bundle are sealed in the framework, thus avoiding the use of end or cover plates.

In a suitable construction, the framework is built up of a series of T bars extending radially in pairs from the driving hub. The periphery of the latter is advantageously made polygonal or with flats, and the pairs of bars extend from the angles at the lines of intersection of adjacent flats, being so placed that the webs of the bars of each pair extend inwardly in the same radial plane and their flanges lie in the outer face of the framework. These radial bars are rigidly connected by circumferential bars or strips attached to adjacent flanges on each face or side of the framework.

Alternatively, the framework may be built up of a series of flat bars, instead of T bars, extending radially in pairs from the driving hub. In this case the two outer plates of alternate bundles of plates are preferably made wider than the inner plates, so that they overlap the outer plates of the adjoining bundles where they make contact with the bars.

The casing of the apparatus is advantageously of rectangular form in cross section, and the flat top thereof can serve as the bottom of a tank for water for cooling the casing.

Carbonization.—No. 230,281.

Imray, O. Y., of London.

(A communication from S. P. Curtis, of Philadelphia.)

No. 7502; March 24, 1924.

The process is for the manufacture of hard low-volatile coke, and gas of relatively high calorific value, together with the recovery of oils. It consists in heating the coal in a chamber having a centre take-off duct; causing the liquids, gases, and vapours evolved at the low temperatures to travel through the coolest portion of the material in the chamber and escape therefrom before they can undergo secondary decomposition; carbonizing at a high temperature the coked residue; maintaining a plastic film in the body of material in the chamber, which separates and protects the liquids, vapours, and gases escaping through the coolest portion from the high temperatures used to carbonize the coked residue, and from contact with the high-temperature gases evolved from this coked residue; and causing the high-temperature gases to escape freely through an outlet distinct from the one through which the low-temperature products escape.

Gas Cookers.—No. 230,506.

Helps, G., of Nuneaton.

No. 22,673; Sept. 10, 1923.

By this invention the flue pipe from the outlet nozzle of the cooker is brought down to a level just above the burners in the oven, or below them, as experience with a particular oven proves necessary. Such an arrangement, claims the patentee, balances the pressure inside and outside the oven. The waste occasioned by the oven being open at the bottom is neutralized, as the pull on the outside air would only be that measured by the difference in the levels of opening and the flue pipe end. Instead of bringing down the flue pipe as described, an orifice may be made in the closed bottom, which will answer the same purpose.

Geysers.—No. 230,525.

Gausden, A. H., of Wallington.

No. 28,936; Nov. 16, 1923.

This invention relates to geysers of the instantaneous hot water type, and has for its object an improved construction whereby water is caused to flow by pressure up the jacketed sides of the geyser, and then by gravity over a number of flat spirally corrugated metal plates in a zig-zag manner.

Gas Meters.—No. 230,582.

Anderson, J., of Edinburgh.

No. 867; Jan. 11, 1924.

This invention relates to valves for prepayment gas meters. During and since the war, states the patentee, difficulty has arisen with the operation of meters owing to the fact that the gas contains more matter in suspension than previously, causing the deposition of grit on the valve and its seating, preventing full closure. The object of the invention is to overcome or minimize this difficulty. The invention consists in the employment of a valve of a rotating or sliding type—as distinct from the usual form of valve—preferably one comprising a cup or disc with a ground face mounted on a pivoted arm and capable of being moved over the ground face of a port with a guiding extension.

No. 230,583.

No. 868; Jan. 11, 1924.

This invention relates to prepayment mechanism, and its object is simplification. It consists in measuring-out mechanism comprising a pair of gear wheels mounted on different axes; the smaller operated from the prepayment mechanism, and the larger carrying, or controlling, means (such as a further wheel) for effecting control of the valve by a screw acting both as a rack and also as a worm, and in addition operating an indicator.

Gas Burners.—No. 231,115.

Helps, G., of Nuneaton.

No. 529; April 7, 1924.

By this invention the adjustment of the air to atmospheric burners may be regulated automatically. A gas burner is provided with means whereby the turning of a tap partially to shut off the gas causes the partial closing of a restricted passage in the plug, which passage acts as the injector nipple.

APPLICATIONS FOR PATENTS

[Extracted from the "Official Journal" for April 8.]

Nos. 8383-9057.

Brown, F. A.—"Gas supply indicator and regulator." No. 8569.
Davidson, W. B.—"Distillation of tar, &c." No. 8716.
Fisher, H.—"Gas cookers, &c." No. 8541.
Humphreys & Glasgow, Ltd.—"Manufacture of water gas." No. 8629.
Kirkham, Hulett, & Chandler, Ltd.—"Apparatus for effecting intimate contact between liquids and gases." No. 8636.
Koller, K.—"Pressure-gas producers." No. 8825.
Michie, A. C.—See Davidson, W. B. No. 8716.
Muddiman, E. W.—See Davidson, W. B. No. 8716.
Shaw, J. F.—"Retorts for heating coal, &c." No. 8488.
Soc. L'Air Liquide, Ste. Anyme pour l'Etude et l'Exploitation des Procédés G. Claude.—"Distillation of coal." No. 8838.
Stokes, F. W.—See Kirkham, Hulett, & Chandler, Ltd. No. 8636.
Tormin, R.—"Manufacture of fuel from coke." No. 8849.
Weir, Ltd., G. & J., and Weir, J. G.—"Combustion of fuel and utilization of products of combustion in power production." No. 8887.
Zack, M.—"Gas retorts, &c." No. 8614.

[Extracted from the "Official Journal" for April 16.]

Nos. 9058-9590.

Aldridge & Ranken, Ltd.—"Tipping-apparatus for unloading coal wagons." No. 9372.
Ashley, T. J.—See Aldridge & Ranken, Ltd. No. 9372.
Bauer, H.—"Gridwork for gas scrubbers, coolers, &c." No. 9508.
Conlay, C.—"Retort lids." No. 9540.
Hansford, J.—"Prepayment gas meters." No. 9164.
Rombach, P.—"Gas meters, &c." No. 9386.
South Metropolitan Gas Company.—See Conlay, C. No. 9540.
Wilderspin, G. H.—"Gas retort furnaces." No. 9195.

Profit-Sharing.—At a conference of directors, managers, foremen, and forewomen held at Oxford last week, Mr. Duncan Todd, a Ministry of Labour official, said that the gas industry was the only one in this country which had been largely reorganized on a co-partnership basis; and the success attained had been mostly due to the strenuous advocacy of the principle by Sir George Livesey and his successors as Chairmen of the South Metropolitan Gas Company.

A Loss at Conway.—The accounts of the Gas Department of the Conway Town Council show a surplus of £2724 8s. 7d. on the revenue account, but after meeting redemption and interest on loans this was converted into a loss of £737 7s. 8d., which increased the deficiency to £11,893 4s. 8d. The balance-sheet shows that £56,029 1s. 2d. was expended on the works, and including the amount overspent up to date shows an excess of assets over liabilities of £14,967 16s. 6d. The make of gas per year has increased from 13,391,000 in 1899 to 56,111,000 c.ft. in 1924, and the gas produced per ton of coal has increased in the same period from 8058 to 12,692 c.ft.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following notices have appeared in the "London Gazette" re-arding applications to the Board of Trade under the Gas Regulation ct.

SPECIAL ORDERS.

Midhurst Gas Company, Ltd.

An Order under section 10 is to be applied for by the Company to thorize them to use scheduled land for gas purposes, to supply gas various parishes, to make provisions as to capital, to prescribe gas ices and rates of dividend, and to formulate regulations regarding e supply of gas.

Southampton Gas Light and Coke Company.

The Company are applying to the Board of Trade for a Special rder to extend the limits of supply, to increase the maximum rates dividend and borrowing powers, to authorize the establishment of co-partnership scheme, to make further provisions with regard to e issue of capital and the supply of gas, and for other purposes.

METROPOLITAN GAS COMPANY OF MELBOURNE.

The half-yearly meeting was held at the offices of the Company, linders Street, Melbourne, on January 28—Sir JOHN GRICE (Chair-an) presiding.

The CHAIRMAN said that the cost of coal for the half-year amounted £305,951.

The revenue from the sales of gas—£659,647—showed a decrease £2677 in comparison with the corresponding period of 1923, due reductions in the price, which was now 6s. 8d. per 1000 c.ft.

The total quantity of gas sold during the half-year was 1964 million ft., as compared with 1819 millions during the corresponding half 1923—an increase of 8·01 p.ct.

From residuals the receipts were £150,204—an increase of £9556 er the corresponding period in the previous year. The operations the stove and fittings department again showed very satisfactory sults. Special efforts, by means of suburban cookery demonstra-ons and canvassing in various suburbs to increase the use of gas ooking stoves, had resulted in an output of these for the year of 51, as compared with 7838 last year. Sales of other appliances had et with a good response.

The number of meters fixed at Dec. 31 was 168,928, as compared ith 166,513 at the same date last year. The profits for the half-ear under review amounted to £138,677, from which sum transfers £41,763 had been made to the reserve fund, £5000 to the meter enewal fund account, and £10,000 as a nucleus of a staff superannua-on fund, leaving a balance of £81,914. It was recommended that dividend at the rate of 7s. 6d. per share be declared, absorbing 82,197, leaving an amount to be carried forward of £71,778.

During the half-year 14½ miles of service mains and nearly 4 miles f trunk mains were laid, in addition to 57 miles of services.

The continuous vertical carbonizing units at the West Melbourne Vorks, as recently improved, continued to give the greatest satis-ction.

At the last half-yearly meeting they were informed that the Direc-ors were issuing 20,000 new shares of £5 each. Of these, 14,824 ere disposed of for an amount of £107,566 15s.—an average of 7 5s. 1·5d. per share. The balance of 5176 shares unsold at the uction were offered to shareholders as follows: In the Common-ealth, 4387; in Great Britain, 789. At the upset price of £7 5s. er share, the whole of the 4387 shares offered to Commonwealth hareholders were taken, the amount received being £31,805 15s. Of the 789 shares similarly offered to English shareholders, 342 were ccepted, leaving a balance of 447, which were disposed of in Mel-ourne in November last for £3479 7s. 6d.—an average of £7 15s. 8d. er share. The total net premium received from the issue, after pay-ent of all expenses, including printing, brokerage, and advertising, as £43,527, which was credited to premium capital. Debentures to he amount of £38,000 at 4 p.ct. fell due on Oct. 1, and the Directors ecided to issue a conversion loan of 6½ p.ct. debentures at £98 10s., vith a currency of eleven years. Holders of the maturing debentures onverted to the extent of £15,700, the balance of £22,300 being ubscribed by the public. The Company had considerable commit-nents which might render it advisable to make a further issue later n the year.

Mr. G. S. ALLEN moved: "That a dividend at the rate of 7s. 6d. er share for the half-year on 218,386 shares, and at the rate of 3s. 9d. n 1614 shares issued on Oct. 1, 1924, be declared."

Mr. J. WALKLATE seconded the motion, which was agreed to.

Newtownards Gas-Works Loan.—At a Ministerial Inquiry into he application of Newtownards Town Council for sanction to bor-ow £6000, and to have a running overdraft of from £8000 to £10,000 funded as a loan, the Town Clerk said the loss on the gas ndertaking was occasioned by war conditions, &c. For the year nded March 31, 1919, the loss was £2386; 1920, £1977; 1921, £1807; and 1922, £3016. The concern had been holding its own or the last two years. Mr. John P. M'Ilwaine (the Gas Manager) ave evidence as to the consumption of coal for the years 1919 to 1923, nd detailed the cost of production and distribution of gas; pointing ut that the loss, in a large measure, was due to the small consump-ion, particularly by the factories, which had given up the use of as engines and installed crude-oil engines as a cheaper means of riving their machinery.

THE AUSTRALIAN GAS LIGHT COMPANY'S WORK AND PROGRESS.

From a Souvenir Booklet.

The history of the gas industry in New South Wales extends over the reigns of five monarchs of England, for, as far back as the days of King George IV., the pioneers of Sydney considered lightening the gloom of their straggling streets by the then newly discovered illuminant—gas. Their consideration took definite form in the reign of the next Sovereign, William IV. In 1837, just prior to Queen Victoria's accession to the Throne, a quaintly worded Royal Charter gave power for the formation of the Australian Gas Light Company, for the purpose of "effectually lighting the said town of Sydney." At that time the entire white population of the infant Colony of Australia numbered only 150,000, but what the pioneers of Sydney lacked in numerical strength they more than made up in courage and enterprise. They launched the first gas company in Australia only twenty-five years after the incorporation of the first in the world—now the Gas Light and Coke Company. The gas undertakings of Paris and Berlin came into being a few years earlier than that of Sydney.

To celebrate the birthday of Queen Victoria, May 24, 1841, the streets of Sydney were first lighted with what the Press of the day, in its enthusiasm, described as "this exquisite production of science . . . this pure, brilliant, and inoffensive illumination of gas."

Literally, the Australian Gas Light Company was founded upon a rock, the sites for the first works, gasholder tanks, and offices being actually hewn out of the solid sandstone at Darling Harbour. Each of the first two holders had a capacity of 45,000 c.ft., which the Directors of those days referred to as "being sufficient to store up a superabundant stock of purified gas to meet any emergency, the 90,000 c.ft. of storage being considered more than adequate for all the wants of Sydney for many years to come." How far along the road of progress the Company has advanced since then is shown by the fact that it now has five holders with a total capacity of nearly 20 million c.ft., one of which is the third largest in the world, while during the last fiscal year no less than 406 million additional c.ft. of gas had to be made. The make of gas now reaches an annual total of just on 7000 million c.ft.

From the small concern of the early 'forties, the Company has grown to be the seventh largest gas undertaking in the British Empire, while it is rapidly overhauling the gas companies of the great cities of Manchester and Liverpool for the honour of fifth position.

New South Wales is blessed with a wealth of coal, but that wealth must be conserved. The Australian Gas Light Company is in line with the gas industry generally in the economical utilization of the world's coal resources. Recognizing the national need for extended use of gas as a substitute for the wasteful burning of coal, the Company is encouraging gas utilization by the introduction of concessions in price and the provision of a special demonstration hall. This is equipped with up-to-date furnaces and appliances for the convenience of manufacturers desirous of making practical experiments, under actual working conditions, in the use of gas as an industrial fuel. Manufacturers find in the cheap rates for industrial gas a solution of one of their greatest economic problems, and they welcome the opportunity given by the Company to test its possibilities.

By the original Royal Charter of 1837 the capital of the Company was limited to £100,000, but this restriction was removed by subsequent legislation. To-day capital stands at nearly 4½ million pounds sterling, which has been contributed by over six thousand share and debenture holders, most of whom are actual customers of the Company. A big percentage of the employees are also shareholders, a fact which gives them a personal interest in the organization which they serve. With the shares of the Company spread over so great a number of stockholders, and with the customers and staff taking part in the financing of the concern, the Australian Gas Light Company is a co-operative organization in the true sense.

The Company, in its works, out-stations, branches, and head office, employs 3000 people; the wages and salary bill amounting to well over £800,000 per annum. The relations between the Company and its employees are harmonious, which is due in great measure to the smooth working of the conciliation systems in operation. This happy condition of affairs has been more marked since 1920, when an agreement was completed between the Company and the Gas Employees' Union, which represents the main body of the workers. This agreement was the basis for a system of conciliation unique in the industrial history of the Commonwealth; all disputes and labour difficulties now being settled in an atmosphere of reason around the table of the Conciliation Committees. The success achieved by these Committees has been remarkable.

A keen interest is taken by the Company in the educational efforts of its staff; and fees are advanced for tuition in approved commercial subjects. An extensive welfare scheme has been inaugurated, and is enthusiastically supported by the staff. Comfortable rest and luncheon rooms, medicine chests, nursing attention, and facilities for social functions are provided, under the care of a Committee elected by the staff from among its members.

Winchester Preference Stock Over-Subscribed.—An issue by the Winchester Water and Gas Company (which was made locally) of 5½ p.ct. preference stock has been largely over-subscribed—practically all those tendering at par having to remain unsatisfied. Announcing the result, a Winchester paper says: "That the stock in a local undertaking should command such attention must be very gratifying to the Directors and stockholders, and is evidence that it is widely realized that the citizens of Winchester are well served in their water and gas supplies."

COLOMBO GAS AND WATER COMPANY, LIMITED.

Annual General Meeting.

The Annual General Meeting of the Company was held at the Offices, No. 148, Gresham House, Old Broad Street, E.C., on Monday, April 6—Mr. Strachan C. Clarke (Chairman) presiding.

The Secretary (Mr. A. C. Pullen) read the notice convening the meeting and the Auditor's report.

The Chairman: Gentlemen, a copy of the report and statement of accounts having been sent to all the shareholders, I will ask you to take them as read. One of the Directors, Mr. Robert H. Glen, is not able to be with us to-day, as he is now on his way to the East, and will be at our Colombo Works on the 18th inst. During his stay in Ceylon, he has undertaken to report to the Board as to land which may be available, as we should be prepared for future extensions.

I am pleased to state that the total gas sold during the year was 13·5 p.ct. more than in 1923; the private consumption being equal to 82 p.ct. of the whole. To encourage the use of gas for cooking and heating, we arranged last year a specially low rate for same; and at the end of August a scheme was started for fixing cookers entirely free to consumers—a moderate rental being charged for the cooker itself. At our last annual meeting I referred to the fact that the Ceylon Government had passed the hydro-electric scheme, and the work of construction is now proceeding. It is therefore very necessary for this Company to obtain all the trade it possibly can in gas for heating, and no effort to that end is being spared. The total number of cookers in use at Dec. 31 last was 423, compared with 209 at the end of 1923; so we have doubled the number in one year.

The alterations and extensions at our works have been completed; and, as we have now sufficient plant to meet the gas requirements of Colombo for very many years, we hope business will continue to forge ahead rapidly. An amount of £14,906 has been added to capital account in connection with extensions, and £4000 has been appropriated from the retorts reserve for the renewals and replacements. The walls and roof of the old retort house were taken down, and the building was reconstructed; fresh retorts and mouthpieces being supplied for old beds. Reference to the capital account will show also that we paid off debentures amounting to £3800 during last year. A few further bonds were paid off on Jan. 1 last, and debentures amounting to £3300 fall due on July 1. These will be repaid, and the Company's total debenture debt will then amount to only £3950; the bonds being met as they mature.

We carbonized 679 tons of coal more than in 1923, but the total cost for coal is somewhat less. The average rate per ton for 1925 will show a further considerable diminution, and reductions in the gas rates consequently came into force as on the 1st inst. at Colombo. The average of gas made per ton for the year was 14,513 c.ft. of 450 B.Th.U.; and these figures, produced as they are from Indian coal and with native labour, are highly satisfactory, and reflect the greatest credit on our Manager. I may say that the make per ton for February this year was 16,666 c.ft. We hope to show an average make for the whole of the year considerably in advance of the 1924 figures.

The total for wages and salaries is about the same, and includes the bonuses paid on profits to all local employees from the Manager to the lowest workman. The Directors attach much importance to this profit-sharing arrangement. Maintenance of works and plant is slightly higher. We paid in 1923 for two new motor lorries, but in 1924 there was more expenditure on the works. Maintenance of mains shows a figure of Rs. 20,334, which is not a high cost. The total mileage of mains is 106. Trade charges was rather more; but the cost of advertising, included in this account, went up from Rs. 1583 to Rs. 6841, partly counterbalanced by the fact that we received considerable sums for the use of the Company's weighing scale, which moneys are credited to trade charges. Our Manager pays particular attention to the work of propaganda, and specimens of our advertisements and pamphlets are about these rooms.

On the credit side of the revenue, I would point out that gas rentals improved by Rs. 33,740. The quantity of gas sold private increased by 14 millions, and public by 2¾ millions; these increases in sales being offset to some extent by the reduction in prices. The revenue from residual products was considerably higher; coke sales being increased by 770 tons, and tar sales by 31,574 gallons. The net coke available for sale amounted to 9·93 cwt. per ton—a most satisfactory feature of our working. The percentage of the value of residuals on cost of carbonizing material for last year was 81 p.ct. Gasfittings account showed improvement. We made additional profit on the erection of new arc lamps, brackets, &c. Exchange account shows a credit arising from adjustment of remittances and shipments. I would point out that our assets remain in the books at 1s. 4d. per rupee, although the rate on Dec. 31 was over 1s. 6d. I think these are all the comments needed on the accounts.

The balance of net revenue is £28,509 17s.; and the Directors recommend a final dividend of 3½ p.ct. on the preference shares, less tax, and a final dividend on the ordinary shares of 5 p.ct., free of tax, also that £10,000 be added to the general reserve. Here I would remark that, from advices just received, the output of gas at Colombo for the past three months increased by 11¼ p.ct., the gas made per ton averaged 16,153 c.ft., and the rupee profit showed improvement.

I now come to a matter which has been engaging the attention of the Directors for some considerable time. Our general reserve account, after adding the £10,000 now recommended, will amount to £35,433; and we have other reserves. Investment account stands in our books at £42,693, and if the bank loan of £12,500 be deducted there is a credit balance of over £30,000; so that our financial position is very satisfactory. For some time the Directors have felt that the Company's proprietors, who in years gone by waited so patiently for a fair return on their shares, should benefit by our present position; and the Board recommend that bonus shares be issued to the ordinary shareholders at the rate of one bonus share for each three ordinary shares held. We have also decided to ask your acceptance of new Articles of Association, in order that our shares may be officially quoted on the Stock Exchange. The Committee will not, at present, sanction the request for a quotation, on the ground that our Articles are out of date. As the Company was established in 1869, we can well understand this view. We further consider that the ordinary shares should be converted into shares of £1 each from the present figure of £10 each. Extraordinary meetings will be called shortly to place these proposals before you in detail, and to ask you, if thought fit, to give effect to same.

Before I sit down, I wish to again refer to Mr. Johnson, our present Manager. I have already mentioned, among other features of our working, the carbonizing results obtained last year; and the Directors are in every way most pleased with everything that Mr. Johnson is doing for the Company. He does not spare himself, and it is right that I should draw your particular attention to what he is doing for us. With these remarks, I have pleasure in moving that the report and accounts be received and adopted.

Mr. John G. Wardrop seconded the resolution.

Mr. Alfred W. Oke remarked that the shareholders fully appreciated the policy of the Board, and were pleased with the results of same.

Mr. A. J. Kingdon said that the Directors were to be congratulated in being able to bring forward such an excellent report and accounts. Much praise was due to the Engineer at Colombo for the very able manner in which he had managed the affairs of the Company there; also to the Secretary in London for the keen manner in which he undertook his duties. In obtaining over 81 p.ct. of cost of coal from residuals, the Engineer had recorded a result rarely heard of, even in England. This also indicated that the Board had been well advised in the purchase of coal.

The Chairman then put the motion to the meeting, and it was carried unanimously.

The Chairman moved the following resolution—viz.:

"That a dividend for the year ended Dec. 31, 1924, at the rate of 7 p.ct. per annum upon the preference shares, less income tax, and 10 p.ct. per annum upon the ordinary shares, free of income-tax (both less interim dividend paid on Oct. 1, 1924), be and is hereby declared, the warrants to be payable on April 17."

This was seconded by Mr. John G. Wardrop, and carried unanimously.

The Chairman then proposed the re-election of Mr. Robert H. Glen as a Director, which was seconded by Mr. Alex A. Johnston who remarked on the great value of Mr. Glen's services to the Board. Mr. Johnston said that, although he personally had only been on the Board a short time, he could see that the Company's position was due to able direction and management. The future prospects were good and the time was ripe for the issue of bonus capital referred to by the Chairman. Even after the addition to capital account of a further £20,000 ordinary shares, the Company's capital per million c.ft. of gas sold would compare favourably with that of English companies of a similar capacity.

The motion was unanimously carried.

Major Heriot R. Glen proposed the re-election of Mr. William Cash as Auditor for the current year, which was seconded by Mr. A. J. Kingdon, and carried unanimously.

The Chairman proposed a vote of thanks to the staff in London and Colombo. He said the Company's present position was largely due to the hard work of the Secretary, who was of the greatest assistance to the Board. He could add no more as to the Manager, except to say that Mr. Johnson was coming home this year on leave, and might visit England more often than in the past.

Mr. A. J. Kingdon said he wished cordially to second the motion which was carried unanimously; and the Secretary briefly responded.

Mr. Alfred W. Oke proposed a hearty vote of thanks to the Chairman and Directors, and remarked that the Chairman had given shareholders some very welcome news. The Company was progressive, and was very competently managed.

Mr. H. Gage Edwards seconded the resolution, which was unanimously carried, and the proceedings then terminated.

Riscavoid.—This is the title of a Company registered, with a capital of £500, to acquire inventions relating to a device for the automatic closing of gas ducts when the supply of gas ceases or falls below a predetermined pressure.

New Capital for Littlehampton.—To provide the necessary extensions to cope with the growing demand for gas, the Littlehampton Gas Company require further capital; and accordingly Messrs. A. & W. Richards have been instructed by the Directors to offer for sale by tender £5000 of 6 p.ct. redeemable debenture stock, at the minimum price of par. Tenders must be received by the firm at No. 37, Walbrook, E.C., by Tuesday morning, April 28.

Price of Gas at Dunfermline.—A possible rise in the price of gas during the current year, in view of the fall in the value of residuals, was hinted at recently in the Dunfermline Town Council; but a statement made at last week's meeting showed that after all there would be no need for this. The Convener of the Gas Committee (Mr. Smith) announced that they had just completed the purchase of 20,500 tons of coal for the year, at an average cost of 19s. 7d. per ton, or 5s. 2d. less per ton than the previous year's supply. He was of the opinion that at the price mentioned the decrease of revenue from residuals would be balanced by this saving, and therefore the price of gas would remain at 2s. 6d. per 1000 c.ft.

The Team By-Product Coke Company.—The Company experienced a setback in the year ended Nov. 30, 1924; a loss of £40,107, after providing for taxation, being recorded, as compared with a profit of £52,501 for the previous year, and a loss of £31,595 for 1921-22. The Directors state that the economic dislocation on the Continent, which resulted largely from the Ruhr occupation, prolonged the severe depression in the iron trade, and caused during the year a disastrous reduction in the demand for coke. As a result, it was impossible to keep the Company's works fully employed; and the average production over the whole year was equal only to 70 p.ct. of the normal output. Since the end of the financial year the volume of business has increased, and the works are now on approximately full output.

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

The market returned to business after the Easter break without finding any improvement in conditions. Many of the collieries which are working have fairly full turns for a week or so ahead; but forward inquiry does not show any signs of developing, and the outlook for the end of the month and later is as bad as ever.

At the end of last week it was stated that 75 out of scarcely 200 pits in Durham had been closed entirely, and 40,000 men were idle. In addition to this, there are thousands who are working short time. Orders continue to go to Germany, at prices from eighteenpence to three shillings a ton below English quotations.

Durham gas coals are in poor demand, like all other sorts. Wear Specials are nominally 20s. f.o.b., and best qualities 19s. 6d. to 19s. 9d. They are fairly steady at these prices for prompt; but they can probably be discounted for forward business. Seconds and others are weak, and some makes obtainable at 16s. 9d., though nominal quotations are 17s. to 17s. 3d. The market for coking sorts is lifeless, and prices are 17s. to 17s. 6d. Unscreened bunkers are 17s. to 18s. 3d., according to quality.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

There is no appreciable difference in the coal market conditions in Yorkshire and Lancashire as compared with recent weeks.

Gas coals move steadily under contract, with indications of slightly decreased prices for renewals.

House coal remains steady, and there is no indication that prices will be lower in the near future.

The industrial situation does not improve, and "spot" lots of the lower-grade fuels are available at prices below the average; but these are not being taken advantage of, owing to the difficulty of dealing with contract supplies to which the consumers are already committed.

The slump in export continues, and it is questionable when the position will improve.

Prices at Hull at the week-end were (f.o.b. usual shipping ports): South Yorkshire: Hards, Association, 19s. 6d. to 20s. 3d.; screened gas coal, 19s. to 19s. 6d.; washed trebles, 20s. 6d.; washed doubles, 17s. to 17s. 6d.; washed singles, 17s. to 17s. 3d.; washed smalls, 13s. to 14s.; unwashed doubles, 15s. 9d. to 16s. 3d.; rough slack, 10s. 10½d. to 11s. 6d.; smithy peas, 20s. to 20s. 6d. West Yorkshire: Hartleys, 17s. to 18s.; screened gas coal, 18s.; washed trebles, 18s. to 19s.; washed doubles, 17s.; washed singles, 16s.; washed smalls, 12s. 6d. to 12s. 9d.; unwashed trebles, 18s.; unwashed doubles, 13s. to 14s.; rough slack, 11s.; coking smalls, 10s. to 11s. Derbyshire and Notts: Top hards, 19s. 3d. to 20s.; washed trebles, 18s.; washed doubles, 17s. 6d. to 18s.; washed singles, 17s.; washed smalls, 13s.; unwashed doubles, 15s.; rough slack, 10s. 6d. to 11s. Yorkshire, Derbyshire, and Notts: Screened steam coal, 15s. to 17s. 6d.; gas coke, 21s. to 23s.; furnace coke, 17s. 3d. to 18s. 6d.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

Output is being further curtailed. The suspension of coal-getting during the Easter holidays has helped to relieve stocks at some of the collieries, but not to any very appreciable extent, inasmuch as industrial consumption has been on a much reduced scale, and comparative idleness has reigned in the distributive channels. In no direction is there any strain on transport. Values have naturally tended to depreciate. Old undertakings that are linked, so far as the regulation of wages is concerned, with more profitable properties which have a superior geographical position are in many cases drifting into a hazardous plight. There are grave misgivings with regard to not a few of them. The prickly subject of the seven-hour day is generally avoided in public discussion of the crisis; but it figures very prominently when possible remedies are being canvassed in circumstances which impose less restraint. Thoughtful men among the miners appreciate as thoroughly as anybody does the importance of lowering the cost of production, and it is believed that many of them would be ready to acknowledge the part which the output per man has to play in any solution of this side of the problem.

Cokes are increasingly plentiful. Some of the big gas-works which have been very sure of their grip of the market, and have been adamant respecting proposals to lower district prices, are showing anxiety to cultivate both the industrial and the household trades; the advance of the season aggravating their difficulties.

TRADE NOTES.

"Thermix" Air Heater and Emile Prat Mechanical Draught Systems.

Messrs. James Gordon & Co., Ltd., of Windsor House, Kingsway, London, W.C., are acting as successors to the late Major S. Utting for the sale of the "Thermix" air heater and Emile Prat systems of mechanical draught.

Meldrums' Gas Purification Plant.

Messrs. Meldrums, Ltd., of Timperley, near Manchester, have received an order from Canada for their gas purification plant. The order includes their improved patent gas washer-scrubbers (in duplicate), capable of dealing with 12 million c.ft. of gas per diem.

Falk Stadelmann Gas Cookers.

We have received from Messrs. Falk, Stadelmann & Co., Ltd., of Farringdon Road, London, E.C., a copy of their 1925 list relating to gas cookers and other cooking requisites. It deals with a large number of appliances for this important part of the business of gas undertakings.

The Davison-Waller Water Gas Plant.

Messrs. Davison & Partner, Ltd., of No. 11, Carteret Street, Queen Anne's Gate, London, S.W. 1, have forwarded a copy of their March booklet, which deals with the Davison-Waller water gas plant. It is of interest to mention that, since the publication of this brochure, repeat orders have been received from York, Dorchester, and Ashford.

Dixon's Silica-Graphite Paint.

The Joseph Dixon Crucible Company, No. 22, Duke Street, Stamford Street, London, S.E. 1, have published a new descriptive booklet about their silica-graphite paint. This paint, it may be mentioned, has been supplied in all parts of the world for over 55 years, for the protection of iron and steel structures, &c. It is now being manufactured in England by Mr. C. R. Averill, at the above address.

"A. & M." Pressure-Wave Controllers.

The County of Lanark, District of Middle Ward, have placed a contract with Messrs. Alder & Mackay, Ltd., of New Grange Works, Edinburgh, for a complete installation of "A. & M." patent pressure-wave controllers, to be fitted to all the public gas lamps coming under the Bellshill and Mossend special lighting district. This installation will represent 500 lamps, and will be operated from the Bellshill Gas-Works. The work is to be completed in readiness for next lighting season.

CONTRACTS OPEN.

Coal.

The East Dereham Urban District Council are inviting tenders for a twelve months' supply of screen gas coal or nuts. [See advert. on p. 266.]

Tenders are invited by the Gas Committee of the Todmorden Corporation for the supply of 10,000 tons of gas nuts. [See advert. on p. 266.]

The Thornton Urban District Council are asking for tenders for about 3000 tons of best screened gas coal, nuts, or slack, and 300 tons of steam burgy. [See advert. on p. 266.]

EXTENSIONS.

New Holder for Troon.

At a meeting of the Dean of Guild Court, Troon, on Tuesday of last week, the plans of a new gasholder on the north shore were passed, and the erection of same authorized. The estimated cost is £14,550.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *April* 20.

There is a moderate amount of inquiry for pitch, and the price is nominal at about 41s. to 42s. per ton f.o.b. works.

Creosote is quiet at about 7⅛d. to 7¼d. per gallon net and naked at works.

Pure benzole and pure toluole are about 1s. 10d. per gallon; and solvent naphtha, 95/160, about 1s. 8d. per gallon.

Tar Products in the Provinces.

April 20.

The average values for gas-works products during last week were: Gas-works coal-tar, 28s. 6d. to 33s. 6d. Pitch, East Coast, 40s. to 41s. f.o.b. West Coast—Manchester, 35s. to 36s.; Liverpool, 36s. to 37s.; Clyde, 39s. to 40s.; Benzole, 90 p.ct., North, 1s. 6½d. to 1s. 7¼d.; crude, 65 p.ct., at 120° C., 10d. to 1s., naked at makers' works; 50-90 p.ct., naked, North, 1s. 6½d. to 1s. 7¼d. Toluole, naked, North, 1s. 6½d. to 1s. 7½d., nominal. Coal-tar crude naphtha, in bulk, North, 7¾d. to 8¼d. Solvent naphtha, naked, North, 1s. 5d. to 1s. 6d. Heavy naphtha, North, 1s. to 1s. 2d. Creosote, in bulk, North, liquid, 6¼d. to 6⅝d.; salty, 6d. to 6¼d.; Scotland, 5⅞d. to 6¼d. Heavy oils, in bulk, North, 6¼d. to 7d. Carbolic acid, 1s. 5d. to 1s. 6d. prompt. Naphthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality 2½d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

North Middlesex Capital Issue.—Messrs. A. & W. Richards, acting on the instructions of the Directors, are offering for sale by tender £16,000 of additional ordinary stock of the North Middlesex Gas Company, on terms which are announced in our advertisement pages.

Brentford Price Increase.—The Directors of the Brentford Gas Company regret that, owing to the reduced yield from residual products and to increases in the rates of wages paid, they are compelled to raise the price of gas by 0·8d. per therm as from the date of the reading of the indices for the June quarter. This increase—which is equivalent to 4d. per 1000 c.ft.—will necessitate a corresponding reduction in the dividends paid to the stockholders.

New Preference Capital for Andover.—The Directors of the Andover Lighting and Power Company are inviting tenders for £5000 of 6 p.ct. redeemable preference stock; the money being required to pay off a bankers' loan and to provide increased carbonizing and condensing plant rendered necessary by the growing demand for gas. The minimum price of issue is par; and tenders must be received by the Company, at No. 13, Bridge Street, Andover, by noon of May 12.

STOCK MARKET REPORT.

It was not to be expected that the reopening market, discouraged speculative dealings. The of the Stock Exchange after the Easter Holidays business continued to feel the effect days would be distinguished by any marked of the dearer money, and there was a slight increase of business; but it cannot be said satisfactory in quotations. In the Foreign Mar- that markets were dull, though transactions ket, in spite of the financial uncertainty, were few. The possibility of sensational happenings in France tended to keep dealers and French loans were steady. Home Rails were distinctly depressed. speculators alert until the formation of the The announcement of Cabinet and the passing of the "crisis" the intention of the Great Western Railway to reduce its staff forthwith, in consequence of afforded some relief. Anxiety with regard to lower traffic receipts, came as a shock to the the British Budget, and the rather stringent railway investment market, and prices weak- conditions which developed in the Money Mar- ened.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. April. 17.	Rise + or Fall − on Week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 5	5	5	Aldershot 5 p.c. max. C.	78–81	..	78–80
295,492	,,	,,	4	4	Do. 4 p.c. Pref.	71–76	..	..
1,551,868	,,	Apl. 2	6½	6½	Alliance & Dublin Ord.	66–71	..	66½–67½
374,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb.	63–68	..	..
300,000	5	Oct. 23	8	8	Bombay, Ltd.	5–5¼	..	5⅛
100,000	10	Mar. 5	8½	8½	Bournemouth 5 p.c.	12–13	..	..
425,050	10	,,	7	7	Do. B 7 p.c..	12½–12¾	..	..
150,000	10	,,	6	6	Do. Pref. 6 p.c..	11–12	..	11¾
50,000	Stk.	Jan. 8	3	3	Do. 3 p.c. Deb..	56–59	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb..	76–79	..	..
992,045	,,	Mar. 5	6⅛	6⅛	Brentford A Con.	95–105	−2½	..
990,500	,,	,,	6½	6½	Do. B New	95–105	−2½	95
76,000	,,	,,	5	5	Do. 5 p.c. Pref.	95–98	..	..
366,690	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	76–81	..	76
181,337	,,	,,	6	6	Do. 6 p.c. Rich. Red. Deb.	100–105	..	..
214,740	,,	Mar. 5	11½	12½	Brighton & Hove Orig.	165–170	..	..
244,200	,,	,,	8½	9½	Do. A Ord.	122–125	..	123¾–124½
1,287,500	,,	Feb. 19	8	5	Bristol 5 p.c. max..	96½–97½	..	93¼–94
855,000	,,	Mar. 19	8	7	British Ord..	112–117	..	..
100,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref..	123–128	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb..	72–77	..	..
100,000	10	Dec. 18	8	6	Cape Town, Ltd.	7–8	..	..
100,000	10	Nov. 6	4½	4½	Do. 4½ p.c. Pref..	6–7	..	6½
150,000	Stk.	Dec. 18	4½	4½	Do. 4½ p.c. Deb..	71–76	..	..
626,860	,,	Feb. 19	6	6	Cardiff Con. Ord.	101–104	..	..
237,860	,,	Jan. 8	7½	7½	Do. 7½ p.c. Red. Deb..	104–107	..	..
157,150	,,	Feb. 19	5	6½	Chester 5 p.c. Ord.	89½–94½	..	..
1,513,280	,,	Mar. 5	6	5/11/8	Commercial 4 p.c. Cap.	87–90	−1	..
560,000	,,	,,	6	5⅞	Do. 3½ p.c. Cap.	87–90	..	..
475,000	,,	Dec. 18	3	3	Do. 3 p.c. Deb.	57–60	..	58½
800,000	,,	14 Jan. 15	—	—	Continental Union, Ltd.	35–40	−2	36
200,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref.	88–92	..	..
660,000	,,	Mar. 5	6½	6½	Croydon sliding scale	100–103	..	..
284,975	,,	,,	5	5	Do. max. div.	83–86	..	..
492,270	,,	Feb. 19	6	9	Derby Con.	110–112c	..	..
55,000	,,	Jan. 8	4	4	Do. Deb.	74–76c	..	..
1,002,180	I	Jan. 22	6	4	European.	7–8	..	7½
16,460,070	Stk	Feb. 19	5½	5½	Gas Light & Coke 4 p.c. Ord.	86–89	..	86½–88
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	62–65	..	63–64½
4,062,235	,,	,,	4	4	Do. 4 p.c. Con. Pref.	78–80	..	78½–79½
4,761,930	,,	Dec. 18	3	3	Do. 3 p.c. Con. Deb.	59–62	..	60½–61½
130,000	,,	—	10	10	Do. 10 p.c. Bonds	..	..	195
42,000	,,	—	7½	7½	Do. 7½ Pord Deb.	..	..	..
82,500	,,	Mar. 19	6½	6½	Hastings & St. L. 5 p.c. Conv.	92–97	..	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	73–78	..	..
70,000	10	Sept. 25	10	10	Hongkong & China, Ltd.	16–17	..	..
86,000	Stk.	Mar. 5	10	10	Hornsey 7 p.c.	138–143	..	180–182
1,976,000	,,	Nov. 20	30	10	Imperial Continental Cap.	179–184	..	..
263,950	,,	Feb. 5	3½	3½	Do. 3½ p.c. Red. Deb.	71–74	..	73
235,242	,,	Mar. 19	6½	6½	Lea Bridge 5 p.c. Ord..	96–101	..	..
2,127,340	,,	Feb. 19	5½	5½	Liverpool 5 p.c. Ord.	87½–88½b	..	87½
600,000	,,	Mar. 19	7	7	Do. 7 p.c. Red. Pref.	103½–104½b	+½	..
165,736	,,	Feb. 19	9	8	Maidstone 5 p.c. Cap.	122–132	..	..
63,480	,,	Dec. 18	3	3	Do. 5 p.c. Pref.	54–59	..	..
75,000	5	Dec. 4	7	5	Malta & Mediterranean	6–6¼	+¼	..
541,920	Stk.	Nov. 20	4	4	Montevideo, Ltd.	62–67	..	65⅜
2,061,312	,,	Mar. 5	5	5	Newcastle & Gateshead Con.	79½–80½d	–¼	..
300,929	,,	,,	4	4	Do. 4 p.c. Pref..	72½–73½d	..	..
529,705	,,	Dec. 18	3½	3½	Do. 3½ p.c. Deb.	68½–69½d	+½	..
15,000	10	Mar. 5	11	12	North Middlesex 10 p.c.	..	..	..
75,940	10	,,	7⅞	8⅝	Do. 7 p.c.	..	..	..
300,000	Stk.	Dec. 4	7	9	Oriental, Ltd.	102–107	..	..
188,120	,,	Jan. 8	7½	7½	Plym'th & Ston'house 5 p.c.	109–114	..	..
60,000	50	Mar. 5	13	14	Portsea Island B	96–99	..	..
100,000	50	,,	12	13	Do. C	93–98	..	..
2,289,909	1	—	—	—	Primitiva Ord.	10/0–11/0	+1/9	£/0–10/3
311,100	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb..	79–81c	..	80
600,000	Stk.	Jan. 22	4	4	Do. 4 p.c. Red. Deb. 1911	63–65	..	63¼–64
220,335	,,	Dec. 18	4	4	Do. B. Aires 4 p.c. Rd. Db.	65–67	..	..
321,670	,,	,,	4	4	Do. R'r Pte 4 p.c. Rd. Db.	66–67	..	..
150,000	10	Mar. 19	6	6	San Paulo 6 p.c. Pref.	7⅞–8¼	..	..
125,000	50	Jan. 2	5	5	Do. 5 p.c. Red. Deb.	43–46	..	..
270,000	Stk.	Mar. 19	5½	5½	Sheffield A	102–104c	..	..
419,968	,,	,,	5½	5½	Do. B	102–104c	..	..
1,047,000	,,	,,	5½	5½	Do. C	102–104c	..	..
90,000	10	Oct. 23	8	6	South African	7–9	..	..
6,609,895	Stk.	Feb 19	5	6½	South Met. Ord.	94–96	..	94¼–95½
1,895,445	,,	Jan. 8	3	3	Do. 3 p.c. Deb.	59–62	..	..
734,000	,,	Mar. 5	6½	6½	Do. 6½ p.c. Red. Deb.	102½–104½	..	..
91,500	,,	Mar. 5	8½	8½	South Shields	135–136d	..	..
1,187,795	,,	Feb. 19	6½	6½	South Suburban Ord. 5 p.c.	98–103	..	..
368,837	,,	Dec. 18	5	5	Do. 5 p.c. Deb.	97–100	..	..
647,740	,,	Nov. 6	5	5	South'mpt'n Ord. 5 p.c. max.	83–86	..	..
121,275	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	72–77	..	..
250,000	,,	Mar. 5	7	7	Swansea 7 p.c. Red. Pref.	101–103	..	..
200,000	,,	Dec. 18	6½	6½	Do. 6½ p.c. Red. Deb.	103–105	..	..
120,000	,,	Feb. 19	8	8	Tottenham District A 5 p.c.	116–119	..	117
882,275	,,	,,	6½	6½	Do. B 3½ p.c.	98–101	..	98
181,253	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	75–79	..	..
258,251	,,	Mar. 19	5	5	Tynemouth Con. and New	77–79d	..	..
197,294	,,	Feb. 19	6½	6½	Uxbridge, Maidenhead, & Wycombe 5 p.c..	100–105	..	..
88,330	,,	,,	5	5	Do. 5 p.c. pref.	93–98	..	..
91,800	,,	—	6½	6½	Do. 5 p.c. Maidenh'd	90–95	..	..
30,000	,,	Mar. 5	9½	9½	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	130–135	–5	..
255,636	,,	,,	7½	7½	Do. B 3½ p.c.	110–115	–3	113–114
352,955	,,	,,	6/9/6	6/9/6	Do. C and New	95–100	–2	95–99
352,000	,,	,,	7⅞	7⅞	Wimbledon 5 p.c.	105–110	–4	..
98,000	,,	,,	7⅞	7⅞	Epsom 5 p.c..	115–120	–2	115
88,416	,,	Dec. 18	3	3	3 p.c. Deb.	57–60	..	..

Quotations at :—*a*.—Bristol. *b*.—Liverpool. *c*.—Nottingham. *d*.—Newcastle. *e*.—Sheffield. * Ex. div.

The Industrial Market was steady, but there was very little business done. Courtaulds and Imperial Tobaccos were again exceptions. The price of these two companies' shares have been steadily advancing for some time, and there has been speculation as to which will reach the £5 mark first.

In the Gas Market the depression continues. It will be seen from the Table that Commercial 4 p.c.t. and all the Wandsworth stocks fell during the week. Although these stocks at the prices quoted are good investments, there is a possibility of a still further drop before the inevitable reaction occurs. The Brentford stocks were also marked down by as much as 2½ points. In view of the excellent terms of conversion provided by the Gas Light and Coke Company's Bill (which is now practically certain of becoming an Act), the fall is very remarkable. Primitiva ordinary advanced by 1s. 9d., to 10s.-11s.—a jump of no less than 20 p.ct. on the former average price, and, in view of the state of the Company's accounts, would, to say the least, seem to be scarcely justified.

An issue of interest to gas stock investors is that of the Tottenham District Company, who are offering £150,000 5½ p.ct. Irredeemable Preference Stock. Tenders must be received by May 1, and the minimum price of issue is par.

The following transactions were recorded during the week:

On Tuesday, Alliance and Dublin 60¼ ex div., Bombay 5⅞, Brighton and Hove "A" 123½, 124½, Bristol 94½, 94, Commercial 3 p.ct. debenture 58½, Gas Light and Coke 87, 87⅛, 87½, 88, 4 p.ct. preference 78¼, 78⅜, Imperial Continental 180½, 182, 3½ p.ct. debenture 73, Primitiva 8s. 6d., Tottenham "B" 98. Supplementary prices, Liverpool 5 p.ct. 87⅛.

On Wednesday, Aldershot "C" 78, Alliance and Dublin 67½ ex div., Bournemouth 6 p.ct. preference 11⅞, Cape Town 4½ p.ct. preference 6¼, Gas Light and Coke 87, 87⅛, 87½, 3½ p.ct. maximum 63, 63¾, 63⅞, 4 p.ct. preference 79¾, 3 p.ct. debenture 60¼, 60⅜, 61, Montevideo 65⅜, Primitiva 8s. 10½d., 9s., South Metropolitan 94⅜, 95, 95¼, Tottenham "A" 117, Wandsworth "B" 113, 114. Supplementary prices, British, Norwich, 3½ p.ct. mt. debentures 62, 4 p.ct. mt. debentures (Act of 1890) 71½, 72, Wandsworth New 95.

On Thursday, Aldershot "C" 80, Continental Union 30, Gas Light and Coke 86½, 86⅜, 87⅛, 87⅜, 3½ p.ct. maximum 64⅛, 4 p.ct. preference 79, 79⅛, 3 p.ct. debenture 61, 61⅛, Imperial Continental 181½, Montevideo 65⅝, Primitiva 8s., 9s. 3d., 9s. 6d., South Metropolitan 94⅜, 95, Tottenham "A" 117. Supplementary prices, Gas Light 10 p.ct. bonds 195, Grays and Tilbury "B" 8⅛, 8¼, Wandsworth New 95.

On Friday, Brentford "B" 95, 4 p.ct. debenture 76, Continental Union 30, European 7¼, Gas Light and Coke 86⅞, 86⅜, 87⅛, 87⅜, 3½ p.ct. maximum 64, 4 p.ct. preference 79⅛, Imperial Continental 180, 181, 182. Primitiva 9s. 6d., 9s. 9d., 10s., 10s. 3d., 4 p.ct. 1st debentures 80, 4 p.ct. debenture 63⅛, 64, South Metropolitan 95⅛, Wandsworth, Epsom, 115. Supplementary prices, Brentford 6 p.ct. mortgages 99, Hongkong and China 5 p.ct. debentures 92, Wandsworth new 96½, 97⅛, 98, 99, Watford 3½ p.ct. consolidated 90, 91.

As we have mentioned above, stringent conditions developed last week in the Money Market. On Friday 4 p.ct. had to be paid at the start for fresh money; but the position eased later, and 3⅜ p.ct. was the general rate. Treasury Bills showed an increase in the average rate at which they were allotted—£4 4s. 2·38d., or 10·2d. p.ct. above that of the previous week.

The Foreign Exchange Market was inactive, except for the improvement in the French franc. The rate, which had touched 04 earlier in the week, dropped to 01·40 on Saturday. Belgian francs were 04.85, and Italian lire 110⅝. Sterling was steady at 4·78$^{9}_{16}$.

Silver, with Indian and Continental selling, is inclined to fall, and the price for cash is 31⅞d. per oz. Gold was unaltered at 86s. 7d. per oz., with practically no dealings.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on March 5. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3¼ p.ct. at notice.

GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

(Founded in 1849 as the "Journal of Gas Lighting.")

PROPRIETORS: WALTER KING, LIMITED — OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

Telephone: Central 6055. — Telegrams: "GASKING, FLEET, LONDON."

VOL. CLXX., No. 3233.] WEDNESDAY, APRIL 29, 1925. [77TH YEAR.

EDITORIAL NOTES.

The New Wembley.

In another twelve days the public will be flocking to the British Empire Exhibition; the reopening of which is to be performed by His Majesty the King on Saturday, May 9. Gas and the secondary products of its manufacture are to take their good part in the new display. We understand there has been additional demand on this occasion upon gas service to meet the requirements of the exhibitors; and it is well known that our primary commodity will have a considerable part in the work of the several caterers who will be dealing with the feeding of the great multitude during the six months through which the Exhibition will be open to the public. Regarding the Gas Exhibit, the features of it are to be entirely new, although the old setting will remain. But in addition to the industry's artistic buildings, further adjoining space has been taken, which will be a great convenience for cookery demonstrations and so forth. This will prevent the overcrowding which sometimes took place in the Exhibit last year, and will provide more seating accommodation for the many housewives who will be attracted by the lectures and the demonstrations of the methods of cooking Empire foods. An Imperial atmosphere will be introduced on this occasion by the exposition of the uses of gas—industrial as well as domestic—in our Dominions and Colonies. There is no doubt that the Committee, particularly those who are taking the most active part in the plans, have an intention even to outdo the scheme which proved so magnetic to the public during 1924. In addition to the Imperial feature, the domestic and industrial applications of gas at home will be kept well to the fore. The abilities of gas for labour-saving—so solving the troubles of the housewife, without (as is the case with a competitor) fear of collapse, and with the certainty of economy and high efficiency, if waste is not allowed—will also be continually proved to visitors.

The Gas Exhibit is to be full of movement. Prominently displayed on the main gangway, a motor manufacturing exhibit is being arranged, showing the important industrial uses of gas in that industry. A similar space on the other side of the pavilion entrance will show two gas-engines—one of them of 150 H.P., and over 9 ft. high—continuously at work, and, among other duties, supplying power to a gas wafer-baking oven, from which will be produced no less than 100 tins of wafers daily. Various other industrial appliances will be seen in operation. A working exhibit of pottery making with gas-fired furnaces, conducted by disabled ex-service men of the Ashtead Pottery, is certain to fascinate many. Another interesting section will show the applications of gas in various hobbies—such as woodwork, model making, metal work, and amateur wireless. What with the addition of daylight cinemas, illustrating the thousand-and-one domestic and industrial uses of gas, and cookery demonstrations and lectures, there is no fear of the live gas industry having an exhibit which lacks life.

There will again be the demonstration of high-power low-pressure lighting in the Amusements Park, and gas will be represented in the great housing exhibit in the Palace of Engineering. This exhibit, we are informed, will occupy at least 60,000 sq. ft., and every foot of the space will provide a practical detail in the solution of the housing problem. The main object is to prove, by the erection of actual full-sized houses, the economic and artistic use to which many new materials and methods can now be applied in the construction of houses. The buildings will be of varied types from working-class dwellings to country cottages. In the organization of this display, the Government are participating, through the patronage and advice of the Minister of Health; and municipalities, and those engaged in building by private enterprise, are co-operating to make the demonstration as comprehensive and up-to-date as possible.

It is also learned that the National Gas Council, through the Central Executive Board, have acquired space in the Chemical Section of the Palace of Industry for tar propaganda. The design of the accompaniments for this exhibit has been confided to the well-known artist, Mr. Norman Wilkinson; and he will, there is confidence, do credit to his subject. Here samples of road-making material will be exhibited, in addition to a stretch of tar-treated road; and at the stand literature will also be available descriptive of the advantages of tar in the construction or surfacing of roads. Steps are being taken to ensure that surveyors, chairmen of highway committees, and others interested in the road question will have an opportunity of seeing what we are assured will be a very interesting exhibit. The chemical industry will again this year occupy a prominent position. As last year, the display is being organized by the Association of British Chemical Manufacturers—a guarantee that it will be an interesting and comprehensive exhibit. A number of new features will be introduced, and the keynote will be information for the public. In the scientific section, it is proposed to show how strikingly connected are the various stages from basic materials to finished products. From the consideration of raw coal, the visitor is to be taken through the various stages of its distillation, the products resulting therefrom, such as tar and ammonia, the treatment of tar for the resulting intermediate products, which lead up to the manufacture of dyestuffs. The production of benzole, disinfectants, fine chemicals, medicinal products, and the numerous other chemicals obtained from coal will also be illustrated. The wonders of coal and its products are only partially realized by the public; but at this exhibition the scientists propose to be informative as to these things, which have such an important part in the service and economy of everyday life.

Of the Exhibition generally, it may be said that the interest which the Homeland, Dominions, and the Colonies are furnishing on this occasion will be an enlargement of that which was enjoyed by the public through the wonderful display of last year. From the marvels of our Empire, and the demonstrations of the relationship that exists between science and the things of everyday life, down to the amusements which will be provided, there will be something in the great display for every visitor, whatever his interests. Splendid and attractive as was the gigantic show last year, the one this year will be lighter and brighter, and will make its call to people far and near, even to those across the seas.

An Electrical Inquiry into Domestic Supplies.

A considerable amount of liveliness is noticeable in the electricity supply industry in respect of the exploration of conditions with a view to future developments. There is the Committee, who have been sitting under the chairmanship of Lord Weir, to whom the Government entrusted the task of advising them on the lines that should be adopted in regard to generation and distribution with the object of increasing the availability of electrical energy. The Minister of Transport and the Minister of Labour have been talking in charming language of the interest the Government are taking in the efforts to promote the coursing of electrical energy here, there, and everywhere. But the Advisory Committee have not, so far as we are aware, yet reported; and so we cannot think that the Government have at present any definitely moulded views as to the future, or the assistance they are prepared to render. Now the Electricity Commissioners have appointed a Committee to consider the questions of the development of domestic consumption and alternative methods of charging. The constitution of the Committee is purely electrical; it comprises members of the British Electrical Development Association, the Association of Electric Power Companies, the Municipal Electrical Association, and the Provincial Electric Supply Committee.

It is an interesting feature to find a Government Department concerning itself in this way in the business end of a statutory industry. The fact will undoubtedly have an influence within the industry if recommendations are made by the Committee which commend themselves to the Commissioners, and, through them, are endorsed by the Government. But as to the effectiveness of any recommendations that may be submitted, this will rest entirely with the public. The point has frequently been made by us—that with Government interest so manifestly directed towards the electrical industry, the policy the gas industry should pursue is the highest possible standard of service among the public. In that way it will best protect its interests. It may be frankly confessed that we shall be curious to learn the nature of the recommendations that are made by the Committee of investigation who are to advise as to the domestic development of the uses of electricity. In the first place, they are asked to consider and report what steps are being taken by authorized undertakers to encourage and extend the application of electricity to domestic purposes; the relative effectiveness of such steps; and what further steps could be taken to bring about an increased consumption of electricity in the household. It seems to us that the reference savours somewhat of a reflection upon the business acumen of the existing administrators and managers of electricity undertakings. The potentialities in domestic electrification differ in every area; and there can be no one formula which can have universal application to the encouragement and extension of the use of electricity. Because of the diversity of conditions, it is difficult to judge as to the "relative" effectiveness of the steps already taken to secure development. We may be pardoned for thinking that if electrical undertakings are administered and managed by competent men, they themselves have already considered the trading methods applied in other districts having correspondence with theirs, to ascertain whether or not they are superior to their own. But apparently the Electricity Commissioners do not regard the matter in the same light as ourselves, and are of opinion that the capacity of local administrators for judgment requires supplementing by an Advisory Committee drawn from the various organizations mentioned. Furthermore, one would imagine that all normal steps that can be taken to bring about an increased consumption of electricity are well known to the administrators and executive officials of electricity undertakings. It will be of little use for the Committee merely to present known and normal practices as the "further steps." These must be novel and therefore abnormal. Hence the interest there will be in seeing what the Committee will propose in their report. They will have to be clever if they can devise plans which have not been previously thought of and tried in the forty and odd years of the electricity industry's statutory life.

Then there is that eternal matter of tariffs. As long as there has been an interest on our part in the affairs of the electricity supply industry, the charges for electricity have almost constantly been the subject of attention and discussion. For electricity supply it is felt that something special in the nature of charging is needed. Apart from flat rates and discounts according to purpose and character of patronage, the method most favoured so far is the bi-part one—a fixed charge and a low price per unit. But in most cases the fixed charge is a percentage upon the rateable value of, or upon the floor area of certain rooms in, a house. This sounds ludicrous; but the fact remains that the men of the electricity industry have found nothing better. Neither system has, in respect of the fixed charge, any definite relation to the electrical requirements of the householder. Many electrical men are very properly of opinion that some two-part method should be devised, the fixed charge of which should have relation to the electrical requirements of the consumer. That is the only legitimate foundation for such a system; it is the only manner in which can be eliminated the injustices as between consumers which are found through the operation of the rateable value and floor area elements in existing bi-part systems. We rather think the Electricity Commissioners are surprised that more undertakings have not applied for permission to substitute a two-part tariff for the flat rate one—not compulsorily, but at the option of the consumer. The second item in the reference to the Committee asks them to investigate and report as to what methods of charging for domestic supplies could be authorized as standard ones (subject to the fixing of an appropriate quantum in individual cases) for adoption, at the option of authorized undertakers, in lieu of charging for the actual amount of energy supplied, or by the electrical quantity contained in the supply. There the Commissioners have set the Committee the task of attempting to discover something which the perennial exercise of the best brains in the industry has not yet succeeded in doing. Perhaps concentrated effort will be victorious where scattered endeavour has failed. There are words in the reference against which some existing consumers might protest did they know of them. They are "for adoption at the option of authorized undertakers." Some consumers, until they know of the method proposed to be substituted for (say) a flat-rate system, might object to the option resting only with the authorized undertakers. Now why not set this matter at rest, and get into uniformity with the gas industry? The domestic purposes other than lighting for which the electrical industry are heartily yearning are cooking and room and water heating. Then why not charge by the therm (which has direct relation to those uses), and so get the two competing industries on one basis? We can see the men of the electricity industry smiling over this; we agree there is room for the smile. We also concur in what will be their view, that they would be foolish to enter into competition on the basis of a unit of heat—100,000 B.Th.U.—such as has been applied by statute to the gas industry. But perhaps the Committee may think differently, and will at least take the idea into consideration, even though they reject it as being derogatory to the competitive position for heating purposes of the purveyors of electrical energy.

Then, we see, it may be necessary, in order that the Committee's recommendations may be effective, to make application for legislative powers. The Committee are, in fact, asked to report what legislative powers (if any) beyond those already conferred by the Electricity (Supply) Act would be required to give effect to any recommendations that may be made. If legislation is contemplated simply to make the recommendations permissive, then no harm would be done; but if compulsory application is in view, it would depend upon the nature of the recommendations whether or not the electricity industry would rebel against this method of altering their statutory powers and administrative rights.

We are of opinion there might be a serviceable extension of the reference to the Committee to cognate and, indeed, very pertinent matters. A couple may be suggested for the consideration of the Electricity Commissioners. The first is, What would be the effects in respect of electricity generating and distributing plants assuming these were called upon to give an amount of heat equivalent to the coal now used in a given district—particularly having regard to the seasonal requirements for room heating, the

vagarious temperatures in winter time, and the fact that the peak of the lighting load then obtains? The second point is, Is it to the country's economic advantage that coal should be used for the production of electricity for domestic heating purposes, in view of the efficiencies of generation, distribution, and utilization? Perhaps the Board of Fuel Research might be invited to aid the Committee, if the Commissioners can see their way to extend the scope of the inquiry in the manner suggested. The consideration of these two matters should have precedence of the other three, for upon the answers to the former would greatly depend the necessity for spending much time upon the latter.

Low-Grade Gas and the Unaccounted-for Percentage.

There were several matters of more than passing interest in the Presidential Address of Mr. F. A. West, of Newark, to the members of the Eastern Counties Gas Managers' Association [*ante* pp. 237-240]. In it are found the broad views of a thinker who forms judgment from personal experience and experiment, and is not inclined to attach himself to any particular flock who adopt the practices of those whom they regard as dependable leaders. The members, after visiting the Newark Works and hearing the Presidential Address, have several matters over which to indulge in a little mental exercise for the purpose of examining into, and forming conclusions upon, their validity. But we are confident that, whatever other engineers and managers may think, Mr. West will not shift in any degree from the opinions he has formed as to the best course of procedure in the circumstances with which he is surrounded at Newark. However, we must preface what will be regarded as the cardinal and controversial points of the address by a brief reference to general matters. The Gas Company (whose property is about to pass into the hands of the Corporation) were badly in want of new works; but instead of going to a fresh site, economy suggested the piecemeal reconstruction of the works, until now there is hardly a remnant of the old remaining, although the arrangement may not be precisely what Mr. West would have selected or designed had he been dealing with a virgin site, and so had freedom for the lay-out. He has continued horizontal retorts; and from his method of operating them, he is obtaining a regular flow of gas of even quality. Working 12½ cwt. charges in twelve hours, charging every six hours, and employing temperatures of from 1300° to 1330° C., he is making 72·3 therms from South Yorkshire and Nottingham coal; and, when four beds are at work, the output is equal to 140,000 c.ft. per man per day, for every operation in the retort house—including clinkering furnaces, removing ashes, sweeping-up, &c. No one will be prepared to criticize these results, having regard to the circumstances. So working, and at the temperatures mentioned, it is hoped the settings will have a long life. Absolute control is maintained by routine testing throughout the operations. In this way, troubles are often avoided; and, moreover, a regular supply of 475 B.Th.U. gas is given, of uniform composition and specific gravity. Incidentally, it may be suggested that a useful hint will be found by some engineers in the description given by the President of his coke-handling plant, which was made by a local firm from second-hand steel work from the old retort house.

It is to the controversial part of the address to which we particularly wish to direct attention, because we are confident that there will be dissentients from the views expressed, as well as strong supporters. From his experience with low-grade gas (no lower than 410 B.Th.U.), Mr. West is persuaded that it is uneconomical, and not in the best interests of an undertaking such as that at Newark. He finds that the troubles he experienced through the distribution of gas of that calorific value are disappearing, with economic advantages, by the supply of gas of no higher value than 475 B.Th.U.—only a 16 p.ct. increase. His deductions from the Newark experiences are that, while there are admitted advantages for almost every gas-works in being equipped with alternative methods of gas manufacture, there are also decided disadvantages. He is convinced that in the smaller works it is not an economical proposition to run two different types of gas-producing plant at the same time, as, in such circumstances, the best efficiency cannot be obtained from either. That is true in respect of the smaller works, but, in all industrial works, one has to take into consideration economic efficiency as well as plant efficiency before final judgment is passed in respect of such a question as this. He admits that there is in the auxiliary plant an aid to the control of the local coke market; and, in existing coke market conditions, this advantage is one to which due weight must be given, with, concurrently, other secondary products reduced in value. Any outlet for the profitable utilization of coke is welcome at the present time; and, looking also at developments in competition in the coke market, we are not disposed to belittle this aspect of the matter, having regard to the ultimate economic considerations. There must be regard for the future as well as the present. We also hold that the changing conditions in respect of labour must be kept in view—not so much labour within the industry, but in those industries upon which gas undertakings depend for materials. An obligation rests upon those who have the control of such a supply as that of gas to do their utmost to maintain it in times of emergency as well as in normal conditions. We will not say this is as important as giving constant service in respect of pressure, calorific value, composition, and specific gravity; but it has an importance which should not be neglected, in view of the reliance placed to-day on gas for light, heat, and power. It seems to us that the only point Mr. West has in his favour is the one that two small plants cannot be continually worked each to its highest efficiency. In normal conditions it is not difficult with a water gas or complete gasification plant and a coal-gas plant, if both are under good supervision, to mix the two gases in determined proportions, and so give a supply constant in all respects.

The next point is as to the supply of low-grade gas. Mr. West's experiences have not been good at Newark with gas of 410 B.Th.U.; and he has retraced his steps to 475 B.Th.U., and is much happier in his particular circumstances. He puts the position tersely when he says that, while the low-grade gas was economical to manufacture, it was not the cheapest to sell. What he found was that, as the make went up, the unaccounted-for gas increased in direct ratio until the alarming figure of 20 p.ct. was reached, and there seemed to be no finality about it. So far as the mains are concerned, if they are in sound state, there should not be more leakage with the low-grade gas than with the high grade, unless (with unsound joints) the greater leakage be due to the use of higher pressures with the former. But the fact remains that since the high-grade gas (if 475 B.Th.U. quality is entitled to that nominal distinction) was introduced, the percentage of unaccounted-for gas has in two years been reduced from 20 to 13. This fact the President regards as sufficient evidence to show he is on the right lines. Thermally the loss of 20 c.ft. out of every 100 c.ft. of 410 B.Th.U. gas means a loss of 8200 B.Th.U., while the loss of 13 c.ft. out of every 100 c.ft. of 475 B.Th.U. gas means a loss of 6175 B.Th.U. From the economy point of view the President is right. So far, however, as the distributing system is concerned, we cannot see that there should be a reduction of the unaccounted-for percentage by the mere process of increasing the calorific value by 65 B.Th.U. per c.ft. But there must be a cause for the effects described; and there can be little doubt that the real cause of the high percentage of unaccounted-for gas was the condition which customers' meters attained—after, so we gather, shorter service—during the reign of the low-grade gas. There is no doubt that with low-grade gas there must be complete removal of all impurities which have a deteriorating effect upon the metal parts of meters. The leathers of the meters, too, perished considerably during the years of the supply of the low-grade gas; while the greater proportion of hydrocarbons in the richer gas is having a good protective influence. Those are the points over which there may be discussion between the advocates respectively of low-grade gas and what to-day may be described as the normal grades of gas. And we shall not be surprised to hear of experiences where there has been no undue increase of the unaccounted-for percentage where low-grade gas is distributed. However, technically that is one of the

outstanding features of the address; and in it there is a challenge based on an experience of some duration. But we are not prepared to say that what is stated would apply as conclusive in all local and economic circumstances. It may be that there will have to be greater recourse to complete gasification and lower grades of gas as time passes. No one can yet say positively what will happen; but should that come to pass, then inventive faculties will set to work to defeat such attendant drawbacks as are described in the address.

A highly pleasing feature of the deliverance is the President's firm views on the subject of service. He is a strong believer in supervision not stopping short at the meter, but that it should be carried into the vital quarters beyond. Newark may be classed as one of the pioneers in this. Some years ago the Company obtained an enactment which enabled them to specify the size of internal pipes; and now architects, builders, and gasfitters are all required to work to specification in the piping of houses. Then, again, the undertaking has a well-trained inspector whose duty is to call at every house and inquire if, and see for himself that, everything is working satisfactorily. Mr. West is quite convinced this is an economical scheme, as many small defects are discovered and put right which would otherwise cause the consumer to be dissatisfied. All who take the long and the correct view will agree with him that the general policy of up-to-date gas undertakings should be service to the public, if they are to keep abreast of the times, and meet competition successfully. It is indeed much better to charge a fraction of a penny per therm more for gas, and give thorough satisfaction, than to sell cheaper gas, and not trouble about the consumers realizing good results. Though that fraction of a penny may have, under the sliding-scale, a slight effect upon the dividends of share and stock holders, it is one of the soundest pieces of protection they could have for their capital in these keenly competitive days.

Whatever part of the address is considered, we see in it that the President has one objective to all his doings within the opportunities provided by his environment. It is—Good Service. That should be the predominant consideration throughout the gas industry. It is the highway to maximum progress.

The Industrial Business.

There are indications of a larger activity in the gas industry in connection with the application of gas to industrial operations, and above all a bigger recognition of the fact that, for the best and permanent promotion of this branch of business gas salesmen with special knowledge are required. The "B.C.G.A." have contributed to the promotion of specialization by the formation of a Circle for industrial gas salesmen only; the point as to special knowledge and acumen was strongly emphasized by Mr. Dean Chandler in the remarkably engaging and information imparting paper (published last week) which he contributed to the London and Southern District Junior Gas Association; and the same view underlies all that was said in the paper, which concentrated much, that Mr. C. Bryan Donkin read at the meeting of the Eastern Counties Gas Managers' Association last Wednesday. The largely increased attention which is being given to this subject is very opportune. Industrial depression is fairly rife; there are signs that revival is at hand, but that it is likely to be a progressive revival, and not one which will come upon the country as a rolling tide. The conditions therefore admirably serve as an opportunity for the exploitation of industrial gas heating.

Those in charge of industries are looking around to ascertain where and how they can effect economies; and the gas industry has the means available for assisting in its promotion. But a great deal of care is necessary in treating this matter, because the experiences of gas heating during the war had a twofold effect; and there is need to correct any false impression that may have been formed during that period, and to further the good impressions that were made by being in a position to show the advances that have since been achieved. We get mention of the dual impressions by taking together the papers by Mr. Bryan Donkin and Mr. Dean Chandler. The former states that "during the war, when furnaces were required quickly and in large numbers, there was no time to go into questions of design and efficiency. Consequently users got the impression that gas was an expensive and inefficient fuel. However, very great advances have been made in the scientific design of the gas furnace; and gas can now show efficiencies far greater than other fuels." Mr. Dean Chandler's point of view is: "The use of town gas in all branches of engineering and industrial activity was largely a war-time development. . . . . It was thought in some quarters that the industrial load which had been built up during the war would, after the Armistice, decline and be finally lost; but the advantages of the use of gas as a fuel for a hundred-and-one purposes had been conclusively demonstrated, and its future was thereby assured. Of course, it was to be expected that a sudden drop in the load would occur immediately after the cessation of fighting, but with the return of more normal conditions in industry, the temporary set-back has gradually been made good." Both authors are right. War-time experiences—when all was push and hurry, and time and not cost was the important thing—did give to many men in industry the idea that the fuel cost of gas was high; while others saw the economy and efficiency attributes of gas compared with solid fuel. It is highly important that those controlling industry should get detached from the consideration of fuel costs alone, and give consideration to the economies and higher efficiencies which the change to gaseous fuel produces, and which reduces the over-all costs per unit of production. That is a matter that must be kept well before those concerned in industrial work. Even if fuel costs are considered alone, both Mr. Dean Chandler and Mr. Bryan Donkin show the increased knowledge, compared with the early adventure of gas in this field, that exists to-day as to the points to which strict observance must be given in order to gain higher thermal efficiencies and thus lower the fuel cost *per se*. There is also the question of the correct methods of application, which have a considerable bearing upon fuel cost. There are a right way and many wrong ways of applying gas as a fuel in industrial operations; and that is why a person not fully competent to deal with large propositions may do irreparable harm, through not being able to advise in a manner which will give the consumer the maximum economy. Mr. Dean Chandler supplies an instance of how, by laboratory investigation, the South Metropolitan Company succeeded in proposing an entirely new system for the heating of steel tram wheel tyres, which reduced the consumption of gas, to the L.C.C. Tramway Department, from 0·7 to 0·2 therm per tyre; and another example is given of a development which resulted in a greatly enhanced quality of product.

The papers by Mr. Bryan Donkin and Mr. Chandler contain much information for every gas man who is engaged in the industrial gas business, and they should be read together, and be carefully studied. The subject is one which interests most gas managers, because there is hardly a gas-supply area in which there is not some industry in which gas can be applied. Even villages have now their garages in which motor-car repairs are carried out, and which require heat for the work. The industrial consumer is, as a rule, one whose custom is well worth having; and it can be obtained and retained by gas undertakings by attention to such matters as both authors present in their contributions.

The Thousand Pounds Coke Competition.

Our contemporaries in France, Germany, Holland, and America have published information regarding the coke competition; and inquiries have been made for further particulars from friends abroad. These have been given. The conditions were fully set forth in the "Journal" for Feb. 18; and references to other information which has been sought have since appeared in our columns. We hope all who are working at contributions will remember that the last day for receiving them at this office is June 30. We want as many papers as possible in each of the three sections. A wag asked us the other day who would be the winner of the £200 prize. The members of the Committee will not know who is the winner of that or any other of the prizes until after adjudication of the last of the contributions. Not till then will be opened the sealed envelopes containing the names of the competitors. We might take the

opportunity of mentioning that a paper must only have a *nom de plume* at the top; and the *nom de plume* must be on the outside of the sealed envelope. It would also be an additional safeguard if repeated on the sheet of paper enclosed in the envelope which bears the name and address of the competitor.

Electricity for Gas-Works Purposes.

In the "Journal" for March 18 (p. 662), reference was made to the action of the Ministry of Health in consulting the Electricity Commissioners as to including in a loan applied for by the Goole Urban District Council for gas-works extensions an amount for the provision of electricity generating machinery for plant operation. The Commissioners advised that the Council should take their supply from an electricity supply company. The National Gas Council advised that intervention in such a matter by the Electricity Commissioners should be resisted. We are pleased to learn that the Council have received information that the Ministry of Health has since unconditionally granted the necessary sanction to the Goole Council.

More Capital Wanted.

It is a change to see once more the name of Lt.-Col. E. Eaton, "C.E.," figuring on a prospectus with which 43, Cannon Street, is identified. The Chagford and Devon Electric Light Company, Ltd., require "additional extension capital," and Eaton's name appears on the prospectus in association with the useful baronet—Sir Charles B. H. Soame—and Mr. R. G. Harley as Directors. The perennial officials, Walter Thompson, Solicitor, and Turner & Co., the Auditors, are also there. The Company have opened the mouths of their coffers to wide dimensions. The offer of Chagford and Devon (why should Chagford come before the county?) capital is only for £12,500 of cumulative preference shares of £1 each, for which a premium of 1s. is required; and £15,654 ordinary shares at £1 each, which are entitled to "91 p.ct." of the balance of distributable net profits. Apparently that £28,000 odd will not be enough for the new business to be done at Chagford, as a "limited number" of 7½ p.ct. first mortgage debentures are also waiting acceptance by anyone who is willing to part with his or her money. The Lighting and Power Finance Corporation, Ltd., part of the 43, Cannon Street machinery, are making this offer. A great point is made of the fact that the Company are utilizing water power, and that the Directors have concluded an agreement for supplying in bulk electricity for light, heat, and power. With whom this agreement has been made, is not stated; and no figures are given as to existing business—actual consumption, revenue, profits, &c. A very artful statement is made in a circular accompanying the prospectus: "The possibility of the undertaking being bought out by a larger concern must not be disregarded, in which event considerable capital profit may accrue, and in particular to the ordinary shares, which, after payment out of the yearly net profits of 9 p.ct. to the preference shares are entitled to rank for dividend in the balance of net profits—viz., 91 p.ct." At the top of the prospectus appears the words: "Every application will receive consideration as far as is possible." Of that we have not the slightest doubt. Another copy of the prospectus of the South Midlands and Berkshire Electric Light and Power Company has also been received from a gas shareholder.

Coal Shipments and Values.

In March there was a little more activity compared with February in the coal export trade, but not enough to make those engaged in it any more lighthearted when the figures and prices are compared with those of the corresponding months of last and the previous year. The total quantity exported in March was 4,392,258 tons, while in February 4,344,008 tons were shipped. In the corresponding month of 1924, the amount exported was 5,190,265 tons, and in that of 1923 7,180,102 tons. The values of these quantities were: March, 1925, £4,557,002; 1924, £6,390,574; 1923, £8,817,851. Gas coal shared in the slightly increased activity; the quantity shipped during the month being 600,104 tons, as compared with 568,966 tons in February. The shipments of gas coal in March, 1924, were 687,358 tons, and in 1923, 866,607 tons. The value of the gas coal shipped last month was £603,672, which gives an average per ton of £1 0s. 1·4d., or 5d. less than the average for the gas coal exported in February. Taking the first three months of the year, the total quantity of coal sent abroad was 13,102,317 tons compared with 15,705,950 tons in the corresponding period of 1924, and 18,694,402 tons in that of 1923. Of these quantities in the first quarter of this year, 1,720,846 tons was gas coal. This compares with 1,981,846 tons in the first quarter of 1924, and 2,290,790 tons in that of 1923.

Gas Coke Exports.

There was also rather a better showing in regard to gas coke last month, as compared with February; the respective figures being 52,658 tons and 41,714 tons. In March, 1924, 76,826 tons of gas coke were exported; and in the same month of 1923, 93,865 tons. The value of the gas coke shipped last month was £76,400, which works out to an average of £1 9s. 0·2d. per ton, which is close upon 1s. 7d. less than the average per ton for February. The value of the quantity exported in March, 1924, was £136,708, and in 1923 £144,777. In the first quarter of this year, the total shipped was 158,178 tons, which is rather less than half the quantity sent overseas in the corresponding period of 1924, when it reached 326,455 tons. In the first three months of 1923, the amount of gas coke shipped was 294,553 tons. The values were: For the first quarter of this year, £240,085; 1924, £569,361; 1923, £428,941.

Sulphate of Ammonia Shipments.

Last month the amount of sulphate of ammonia sent abroad was 19,198 tons, as against 26,321 tons in March, 1924. For the first three months of this year, 79,607 tons were shipped, as compared with 87,258 tons in 1924. So far, therefore, we have not succeeded in maintaining the quantity of business done abroad in the first quarter of last year. The best customer up to the present is Spain and the Canaries; the quantity taken by them being 28,699 tons in the first quarter of this year, as compared with 16,439 tons in the corresponding period of 1924. The Dutch East Indies has been the next best customer with 14,474 tons, and Japan follows with 14,182 tons; but last year in the same period Japan bought 32,755 tons.

Coal Tar Products.

In March the export of benzole showed a distinct upward move; the quantity being 53,041 gallons, as compared with 13,246 gallons in March, 1924. But in the first quarter of last year considerably more than twice the quantity was shipped, contrasted with the first quarter of this year; the respective figures being 252,749 gallons and 115,521 gallons. Of naphtha last month, 3463 gallons were sent abroad, as against 4638 gallons in March, 1924. The shipment of naphtha for the quarter was 10,895 gallons, as against 49,797 gallons in the corresponding period of 1924. Taking together tar, oil, creosote, &c., no less than 3,063,280 gallons were sent abroad last month, compared with 2,234,298 gallons in March, 1924. In the first three months of this year, the total quantity exported was 10,828,946 gallons, as against 9,513,748 gallons in the first quarter of 1924.

Gas Oil Imports.

In March 5,721,410 gallons of gas oil were imported, as compared with 3,614,176 gallons in March, 1924. In the first quarter of the year, the total quantity of gas oil imported was 16,250,811 gallons, which contrasts with 16,103,496 gallons in January-March, 1924—a small difference.

Anti-Eczema Soap

As the result of careful research, Messrs. F. & E. Stanton, Ltd., of Lewisham, London, S.E. 13, have been successful in producing an anti-eczema emulsion, and experimental work has enabled them to convert this into a firm, hard, anti-eczema soap, which will not only prevent gas eczema breaking out upon gas workers, but will also cure those who are suffering from it. The firm inform us that they will be pleased to post, free, a 2-lb. sample bar of the soap upon receipt of a post-card from any gas manager or engineer, so that a test may be made of its virtues.

Institution of Civil Engineers.—An Extra Meeting will be held on Wednesday, May 6, at six o'clock, of the various bodies which are co-operating in the work of the Special Committee on Tabulating the Results of Heat-Engine Trials. Mr. J. Carnaghan will introduce the following subject for discussion: "A Standard Code for Tabulating the Results of a Heavy Oil Engine Trial." Capt. H. Riall Sankey, C.B., C.B.E., Chairman of the Committee, will preside.

PERSONAL.

Among recently elected members of the Society of Chemical Industry is Mr. Jacques Abady.

At a meeting on the 21st, Alderman Frederick Joseph West, C.B.E., Lord Mayor of Manchester, was elected a member of the Institution of Civil Engineers.

Mr. Alexander Young, Gas Manager at Tayport, has been appointed Engineer and Manager of the gas undertaking at Bridge of Allan. Educated at Arbroath High School, Mr. Young served his apprenticeship with Messrs. Shanks, of Arbroath. Later he obtained the position of Chief Draughtsman at the Dundee Gas-Works, whence he went to Tayport.

Many readers will be interested to learn that Mr. R. L. Wilson, who has for a number of years occupied the position of Commercial Manager to Messrs. J. Brown & Co., Ltd., manufacturing chemists, of Savile Town, Dewsbury, has been appointed a Director of the Company.

OBITUARY.

In the early part of this month Mr. A. Jacob, Manager of the British Aluminium Company, Ltd., died at Hatch End, Middlesex, at the age of 57 years.

We regret to learn of the death, on the 18th inst., at 93, Morningside Drive, Edinburgh, of the wife of Mr. James O. Scott, of Messrs. Alder & Mackay, Ltd.

ELECTRICITY SUPPLY MEMORANDA.

Some of the circulars issued by electricity supply undertakings regarding electric cooking and heating are probably more interesting to those who understand, than to those who have not the knowledge to estimate, the value received for a given expenditure. We have before us some circulars on the subject sent out by the Great Yarmouth Electricity Supply Department. The first one tells us that in response to an increasing demand from electric lighting consumers who are desirous of taking advantage of electric cooking and heating, the price for current has been reduced to 1½d. per unit (flat rate) for those purposes, or 1d. per unit for all purposes, *plus* a lump payment equal to 20 p.ct. on the rateable value of the premises, *plus* a rent of £1 a year for a No. 19 cooker, 24s. a year for a No. 20 cooker, and 28s. a year for a No. 22 cooker. The householders of Yarmouth who desire to take advantage of electric cooking and heating may find that these processes will take advantage of them. There are two points into which the householder should inquire. One is, Why do the electricity people have to charge 1½d. per unit for cooking and heating, while so much more is charged per unit for lighting? And, Why do they talk about 1d. per unit for cooking and heating under the rateable value system, when there is also the 20 p.ct. in this instance to be divided over the consumption to find the average total cost per unit? They will reply that they want to encourage a day load, and to induce this they charge a low price. But it must be apparent to the poorest of intelligences that if there were the savings and merits about electric cooking that are so lavishly spoken of and circulated, there would be no need for such low prices per unit. The fact is that the potential heat energy in a unit of electricity is so meagre—3420 B.Th.U.—that expediency compels a small charge in order to make any show (even then it is of a remote order) in the competitive field. That is the point to which the attention of householders should be directed—in other words, they should be informed of the modest heat value of a unit of electricity in comparison with the value to be purchased at the same price through other heat agents. That is a matter on which these circulars for the "information" of the householders of Great Yarmouth are as silent as the grave. It would, of course, be a strategical blunder for electricity purveyors to say anything about the matter. What is said is that "the electric method is extremely simple, and requires no previous experience—a point which cannot be too strongly emphasized in view of the misconception which appears to exist in the minds of many people." It is not the method that is extremely simple; it is the householder who believes that it is—for the "simple method" is the seat of several weaknesses, to which it is constantly succumbing to the inconvenience of the user, and which then call for rectifying expert attention. So real is the uneconomy through hotplate inefficiency, and so pronounced are the limitations and the troubles, that we see in the Department's circular that "no stove will be let for a shorter period than twelve months." It is in the circumstances a necessary safeguarding condition.

Yarmouth and the Cooking Load.

Plausible Tales and Incontrovertible Facts.

But we were on price. It is the custom in some areas to trot out consumers' low accounts for electricity for cooking and heating in comparison with gas. It should be pointed out to householders that these are nothing to go by. Such testimony misses out the important factor of work done; the work done must be equal if there is to be any true financial comparison. Householders should also have impressed upon them that a gas therm equals 100,000 B.Th.U., while a unit of electricity equals only 3420 B.Th.U. Therefore 100,000 ÷ 3420 = 29 units of electricity. Any intelligent householder must see when the matter is brought to his notice that—with a slightly higher thermal efficiency in the electric oven than in the gas oven, but with a higher efficiency on the hotplate of the gas-cooker than on the electric hotplate (75 to 80 p.ct. of the work done by a gas-cooker is carried out on the hotplate)—it is impossible, equal work being done, for the electric cooker, in view of the heat value delivered for a given expenditure, to match the gas-cooker for economy. Consumers with these facts before them will realize why in their struggles to secure heating and cooking business the electrical people have to get down to low prices per unit; even then the thermal value given for money expended is distressingly poor. Just as one cannot get out of a jug more liquid than it will hold, so one cannot get more heat out of a unit of electricity than it can generate. But the electricians make out a plausible tale which, without investigation, may deceive many people.

Charges and Costs.

It would be interesting to know how the flat rate of 1½d. per unit for heating and cooking is justified in Great Yarmouth. It is stated that 230 cookers were placed as the result of the Industrial Trades Exhibition held in March last; but the load from these (assuming they are all retained in constant use, which is very doubtful) cannot warrant a price per unit less than the average of the generating costs, let alone the total expenditure, per unit sold. In the year ended March 31, 1924, the current sold for all purposes amounted to 2,094,892 units; and the total cost per unit sold was 2·8d. This was made up as follows: Generation, 1·88d.; distribution, 0·3d.; rents, rates, and taxes, 0·18d.; and management, salaries, printing, stationery, and miscellaneous charges, 0·44d. From this it will be seen that the 1½d. per unit on the flat rate is 0·38d. below the average generating costs per unit, and as much as 1·3d. below the average of the total costs. As to the rateable value system, an illustration will show that in some—perhaps most—cases the revenue per unit will fall short of the average expenditure, although the fixed charge is supposed to cover the standing costs incurred in supplying the consumer. Take a house rated at £50; the fixed charge is to be 20 p.ct. of that, or £10 per annum, which reduced to pence is 2400d. One of the circulars tells us that the electricity consumed for cooking averages 1 unit per person daily. Therefore, supposing there are six persons in a household, this would be 42 units a week. Let us add 8 units a week for lighting and incidentals—seeing that we may be sure the makers of the cookers have not over-estimated the consumption at 1 unit per person a day—this would make 50 units per week, or 2600 per annum at 1d. Adding to this the fixed charge of 2400d., we have 5000d. to be divided by the 2600 units. This works out to 1·92d. per unit. If the householder's consumption is more, it would work out to still less; yet the total charges to which we have referred average 2·8d., and the generating costs 1·88d. This is municipal trading; it is the grossly unfair trading with which gas undertakings are called upon to compete. There is no justification for it. It is also totally unjust to the man who prefers electricity for lighting and gas for cooking. Why should he pay three or four times as much per unit for lighting when the man in our illustration with the cooker can, during lighting hours, both cook and light at a cost of 1·92d. per unit, or 0·4d. above the bare generating costs for the year ended March, 1924. He might be advised to go on to the rateable value system; but would it pay him, with his house rated at £50, if he prefers electricity for lighting only? Flat-rate lighting consumers are, through the revenue they produce, the backbone of electricity undertakings to-day. It is only through their revenue that electricity concerns are able to indulge in these fantastic schemes of making a fixed charge upon rateable value or floor area of rooms (with an additional low charge per unit), instead of upon the actual electrical requirements. However, we may be sure the Gas Company will show the inhabitants of Great Yarmouth that the thermal value supplied by them far exceeds for a given expenditure the poverty-stricken value offered by the Electricity Department.

An Investigating Committee and Domestic Consumption.

A sane and sound electrical tariff to displace the flat rate, with discounts for good loads, is something which, it is admitted in the electricity industry, its men have not yet achieved, despite a wonderful aptitude for arithmetical gymnastics, as instanced in the "Memoranda" last week. There has been a great deal of advocacy of the two-part tariff, of the rateable value form. In

the Act of 1922, power was given to the Electricity Commissioners to supersede the flat rate where they were satisfied with proposed alternatives; but in their last annual report, they stated that very few applications had been made for permission to adopt a new system. Now the Commissioners have appointed an Advisory Committee to report on certain questions affecting the use of electricity and the methods of charging. Allusion is made in our editorial columns to the points which have been referred to the Committee for consideration and report. But here it may be mentioned that the Committee represents various organizations in the industry, and is constituted as follows: Messrs. J. W. Beauchamp (Chairman), S. T. Allen, and A. N. Rye (representing the British Electrical Development Association), Messrs. J. S. Highfield and W. B. Woodhouse (representing the Incorporated Association of Electric Power Companies), Messrs. A. C. Cramb and W. C. P. Tapper (representing the Incorporated Municipal Electrical Association), and Messrs. H. Bentham, F. E. Gripper, and K. A. Scott-Moncrieff (representing the Provincial Electric Supply Committee of the United Kingdom).

The "Safety" of Electricity.

Within a week there were three disconcerting street explosions—at Keighley, York, and Falkirk. At the first-named place an electric cable misbehaved itself not only by fusing, but by melting a gas-pipe. The cable it is stated was twenty years old, and was encased in a cast-iron pipe instead of the usual earthenware conduit as is the modern practice. At both York and Falkirk, the explosions caused manhole lids to make a swift flight in the air, and caused other unpleasant commotion. These incidents appear to be getting more and more frequent; and this suggests that there are towns where a good deal of old distributing material should be replaced by new, laid in the most approved style. Electrical men have dropped talking about town gas leaking into their culverts, because advancing knowledge has taught them that a more potent explosive can be generated by their own systems. From explosions to fires. One was caused in the early hours of last Monday morning at the works of Messrs. Needlers, Ltd., chocolate manufacturers, of Sculcoates, Hull. Coming when the week-end closure had almost expired, the only explanation is electrical fusion; and a curious thing is that it was a man who was on duty at the Corporation electrical power station who, just before two o'clock in the morning, noticed a small flickering flame in the upper storey of Messrs. Needlers' premises. Within ten minutes that small flickering flame became a raging fire owing to the combustible character of the boxes and wrappings in the part of the building where the fire broke out. From fire to failure. Oxford was thrown into partial darkness during the evening of last Saturday week. It would have been plunged into complete darkness had it not been for the fact that the gas undertaking of Oxford flourishes, and it has a good share of the lighting custom. Candles came into temporary popularity.

Compulsory Powers Rejected.

A short time since attention was called in the "JOURNAL" to a Bill which Mr. Harris intended to introduce into the House of Commons for the purpose of increasing the powers of joint electricity authorities. It will be remembered that, when the legislation of 1919 was under the consideration of Parliament, in order to save the Bill, and obtain power to establish the Electricity Commissioners, it was found necessary to delete the compulsory powers. Since then, certain joint authorities have been set-up; but through the want of general agreement in the areas they have not been able to function in the manner originally intended. Some people consider that this is due to the absence of compulsory powers; but as a matter of fact there is a mass of opinion in the industry itself that there should be no compulsion in this matter—that every electricity supply authority should be allowed to take the course which it considers most desirable in the interests of its own undertaking and area. Those who do not concur in this opinion hold that electricity supply should have a national or extensive territorial base. But we have much sympathy with those local authorities who believe that in being pooled, and averaging the costs in respect of generation and transmission, they would not be in such good position as they are by generating for themselves and supplying in a densely-populated area—particularly those industrial in character. Just recently, Mr. Harris moved for leave to bring in the Bill for conferring upon joint electricity authorities the compulsory powers which were deleted from the Bill of 1919. There was a strong opposition to this, which was led by Mr. Austin Hopkinson, whose opinion was that it would be a mistake to do anything which would stereotype the industry and set the dead hand of the State on technical progress. It is Mr. Hopkinson's belief that miraculous changes will in time take place in respect of the methods of electricity generation—in fact, his idea is that, towards the end of the present generation, we shall see the direct production of electricity by the oxidization of coal in some form of carbon cell. He believed that the Bill to confer compulsory powers on the joint electricity authorities would be disastrous to technical progress. The Bill was rejected by 193 votes to 124.

CENTENARY OF THE SOUTH METROPOLITAN GAS COMPANY.

A Volume Worth Preserving.

WHEN, as rarely, people reach a century in life, their friends desire to felicitate and rejoice with them. When large concerns have passed through a century in business, custom prescribes a celebration of the event. Such an anniversary cannot occur again in the lives of anyone associated with the enterprise. Therefore those responsible for the administration of such businesses may be pardoned for indulging in a little celebration and rejoicing, when they may receive from their friends their cordial wishes for continued and still greater progress in the future. In the case of the undertakings of the gas industry (to which we are all proud to belong), there is good cause for congratulation on the ground of past achievement, because they have worked well—not only in times that have been good, but in periods of great tribulation. They have never made a backward movement; they have always gone forward in the development of their businesses, and therefore in public and national service.

The hundredth anniversary of the birthday of the South Metropolitan Gas Company was May 28, 1924; but, through various circumstances, the Directors decided not to have celebrations in connection with the event, but quietly to pass the time as though it was an ordinary occurrence. The decision, however, was accompanied by the resolve to commemorate the completion of the century's work by having a volume prepared briefly surveying the history of the Company, the large expansion of the operations of the concern, and the important part it has taken in the political and technical advance of the industry.

The volume before us is entitled "A Century of Gas in South London." The literary work is good. It is something more than a mere historical sketch. It is so written that it immediately draws one into the life and activities of the Company. It is a book probably rather for the non-technical reader than the gas technician, yet the gas technician who begins to read will want to continue until he has completed the 23 pages of text into which has been compressed a whole century's history of a concern which has ever been adding to its laurels—administratively, technically, and commercially. The illustrations are excellent; and at the end there are a number of portraits of men who have been prominently identified with the Company, and, through the Company and in other spheres, with the gas industry. We shall prize the portraits, because all of them—excepting two—are of men we have known or do know, and whose friendship has been invaluable. We congratulate the Company heartily on the volume.

To return to its literary part. An idea of how the author has managed to present interesting detail in a manner which will appeal to the popular mind, can at once be given. He is dealing with the vast network of pipes under the soil of South London streets; and he says:

> The mains alone are 1340 miles in length; the area under which they spread covers 52 square miles. This network serves about two million people; some 400,000 meters measure the gas which the Company supplies to its customers. We cannot call it a monopoly, even within its own area; yet it maintains an easy supremacy. Its electrical competitor who used to boast that electricity had antiquated gas, can only muster a fraction of its consumers. It is a hundred years old; yet it has not stopped growing. It expands with the population it serves, and develops with the development of industry.

And then we come to a description of the Company's activities. It is pointed out how rigorously gas is tested for its lighting and heating powers, as milk is tested for its fats, so that the Company protects its own customers against the possibility of adulteration. It supplies, in fact, a standard article at a standard price. And then there is reference to the subordinate industries; to the fact that the Company has its own laboratories, both chemical and industrial. It has its own research department, and makes its own gauges and standard burners. It has three chemical works dealing with its own bye-products. It produces 11½ million gallons of tar and 47 million gallons of ammoniacal liquor in a year. Indication is given as to the applications of the products derived from the distillation of coal. Following these impressive facts, are others no less suggestive. The capital of the Company amounts to 9¾ millions sterling; and a regular dividend is distributed to 18,000 shareholders. Some 8000 workers are employed; and yet the Company is untroubled by industrial strife. "In this great organization of workers and capitalists, there reigns profound and perpetual peace, undisturbed even by a threat of hostilities. In this era of industrial unrest, such an equilibrium must be counted remarkable; and the system which has brought it about should be well worth our study."

With such facts in mind, one naturally seeks to know more of the history of this concern; and a page or two later we come into contact with the origin of the Company.

> In 1814 the first gas-works on the South Bank of the river were constructed at Southwark by an enterprising Scot called Munro. These were sold a few years later to the South London Gas Com-

pany, which was in difficulties before 1824, when the struggling enterprise was taken over by some optimists who called themselves the Phœnix Gaslight and Coke Company. With this Company properly begins our story, for in the course of time the Phœnix came to its last roosting-place inside its rival, the South Metropolitan Gas Company.

The Company had a distinct aristocratic parentage; for one of the original proprietors mentioned in the Special Act of 1924 was the great Lord Holland, who, by the way, was a Fellow of the Royal Society, had been Lord Privy Seal, and was to become Chancellor of the Duchy of Lancaster. Among others were the Hon. James Abercromby (afterwards Speaker of the House of Commons), Baron Dunfermline, Thomas Fowell Buxton (a leader in prison reform and anti-slavery), John Petty Muspratt (a Director of the East India Company), and Charles and David Barclay and Frederick and Charles Perkins (presumably the brewers). Thus the Phœnix Company began strongly; and it had, besides, a five years' start of its rival, the South Metropolitan Gas Light and Coke Company, which was founded in 1829. The latter Company, unlike its other competitors, gave the river a wide berth, and chose for the site of its operations 3 acres of land along the Grand Surrey Canal on the eastern side of the Old Kent Road. There, by 1833, the works were completed, and thenceforth began a long and stern fight between the two companies, to end inevitably in amalgamation.

It is noteworthy, in view of the practices of to-day, to remark that:

> The South Metropolitan Company started operations in the good resolution to supply the public with a pure article, and to that end built a purifying-house which was a model of all that such a house ought not to be. Its windows were glazed; there was practically no ventilation; and it is surprising that it lasted so long as until 1836, when it was completely destroyed by an explosion. In its determination to make good gas, the Company used only cannel coal; but the high cost of this raw material forced up the price of the finished article to 11s. per 1000 c.ft., whereas the Phœnix Company was selling its product at 9s. In 1834, the South Metropolitan Gas Company was proudly informing the world that "the purity and illuminating power of our gas are such that 3000 c.ft. will burn as long and give as great a light as 5000 c.ft. of the gas of the Phœnix or any other Metropolitan Gas Company."

With competing companies in the area, the South London supply suffered greatly through its roads being constantly torn to pieces, as well as through plumbers and gas fitters advising innocent householders to take one company's gas or another as their interest in gas fitting and public lighting prompted them. The public suffered, until at length, in 1853—mainly through the policy of Mr. Thomas Livesey—a general peace was concluded, defining the sphere of influence of not only the South Metropolitan and the Phœnix, but of a later competitor, the Surrey Consumers' Gas Company. This "districting agreement," as it was called, shows that here as elsewhere the Company was in advance of the State; for, although the advantages to the public were enormous, it was some years before the House of Commons could be brought to consent to give it statutory sanction. The agreement was the beginning of a movement to amalgamate the various companies which divided South London between them. The first step was taken by the Phœnix Company, which approached the Board of its principal rival in June, 1870. On July 1, 1879, the Surrey Consumers' Company handed over their premises; on Jan. 1, 1880, the Phœnix Company came in with its works at Bankside, Vauxhall, and Thames Street, Greenwich; and in 1885 the two small Woolwich companies became part of the large concern. Thenceforth the South Metropolitan Gas Company held undisputed sway over practically the whole of what is now London County south of the Thames (except only two small areas)—a territory of 52 square miles, stretching from Abbey Wood in the east to Tooting in the west; and from the banks of the Thames southwards to Streatham and Bromley Hill—a densely populated area containing approximately two million people.

The volume gives an insight into the legislative restrictions which were imposed upon the Company. But despite these, and the competition of electricity, the Company, strong in its position and its resources, has triumphed both technically and commercially in the manner already indicated at the commencement of this review. Its history is interleaved—perhaps more than is the case with any other concern—with the legislative, technical, and administrative progress of the gas industry. The great record which it holds in connection with developments in legislation during the time of Sir George Livesey—particularly in respect of the sliding-scale—is matched by the many important technical developments which have been made in engineering (as witness the 12 million c.ft. gasholder), and through its chemical, physical, and research laboratories during the more immediate years. The history, too, of the Company cannot be referred to without allusion to the great strike which accompanied the introduction of profit-sharing by the Company, which has since developed into real co-partnership in administration, participation in profits, and stockholding by the employees. It was a great innovation, and the example, followed by many other gas companies, has given to the industry an incomparable place in respect of labour in the industrial world.

From the momentous year of the birth of profit-sharing or co-partnership in the industry, there has not been as we know, and as the volume before us states, "even the hint of serious trouble with the Company's workmen." How much under the co-partnership scheme the men have received in actual money since its inauguration is not stated; but the fact is on record that the stock of the Company held in the name of the workers amounts to-day to between £400,000 and £500,000. In this connection we should like to quote two or three passages from the volume:

> One result of the scheme was to give the industry freedom from industrial disputes; another was to induce every workman to take an interest in the success of the undertaking. Before he had been merely an employee, now he was a partner, and an increase of sales or an economy in working assumed a new and personal aspect. The public felt the change in the zeal of the outside staff; the engineers in the zest of their artisans. But there were other and higher advantages which showed themselves as the policy developed. Out of co-partnership grew a corporate sense, an administration in which all shared, and by which all were educated in mutual help and brotherhood. A Co-partnership Committee grew out of the joint interests of employer and employed. It consists of about seventy representatives—half elected by ballot of the co-partners, and half of officials nominated by the Board of Directors. The Committee meet every month, or more often if required; and the week before the meeting the workmen's half of the Committee hold a preliminary conference to consider matters they desire added to the *agenda*. As every department is represented, there is a channel through which every employee can ventilate his troubles, and on the side of the management there is a channel through which their ideas can reach the employees. "On the one hand," says Dr. Carpenter,* "we have difficulties, troubles, modifications, suggestions, proposals, recommendations, as the case may be—all flowing from the workpeople through the Committee to the management; and from the management information of all kinds which it desires to disseminate among the workpeople as a whole. The Committee is, in fact, a small-scale Parliament of Labour, with business-like habits and a directness of action which would do credit to its prototype." Such a body is well equipped to smooth out differences before they reach a danger point.

The centenary volume also gives an account of the large, but unobtrusively performed, war work of the Company; and we read:

> In these days when our industrial system is being attacked as decadent and obsolete, such a record as this might serve to answer its critics; and it might be noted for such an argument that these achievements are not the work of an impersonal thing called Capital (although Capital on a great scale was a prime necessity of the undertaking), but of men, or rather of a line of men, who did not exploit, but rather led, labour in the conquest of an element of Nature. The record proves that the brains, courage, and experience of the employer are essential to the success of an industrial enterprise. We have seen how the line of Livesey began in the childhood of the Company; how Thomas Livesey established the greatness of the Company which his son, George Livesey, developed. But the record would not be complete without at least brief mention of the successor of these two men, Dr. Carpenter, who was Engineer of the Company when George Livesey died, and who is now its President and Chairman of Directors. On the death of George Livesey, Dr. Carpenter led the co-operative movement which gave industrial peace to the enterprise; he directed also the work of scientific investigation, in which he himself took the principal part, and created the machinery of research and experiment. There is hardly a leading improvement in the carbonization of coal and the production of gas in which the two Liveseys or Dr. Carpenter are not, in some way or other, connected. And the practical results of these researches, by the generous policy of the Company, have benefited not one enterprise only, but the whole gas industry.

Interest in the volume is maintained to the very end, and that end is compressed into the following passages:

> The carbonization of coal is obviously of vast importance to our national economy since its heat energy is resolved into useful forms with a much higher degree of efficiency than in the production from coal of steam and electricity. It is therefore not unlikely that our industrial development in this country will go along these lines, and that, by the scientific carbonization of our magnificent coal resources, we shall keep our place in the race against competitors who have the advantage in water power. In this national development, the South Metropolitan Gas Company has played an important part. The names of Livesey and Carpenter are associated with almost every process of the industry; and the Company has also led the way in the achievement of something no less important than gas production—peace between Capital and Labour. It has grown with its territory of South London; and at the end of a hundred years, it is entrenched in every road and installed in every house, and thus inextricably connected with the lives of the two million people it serves. This is so strong a position industrially and territorially that the Company, with its great record in the past, has good title to look forward with confidence to the future. Incidentally, it proves that what is called capitalistic enterprise is neither effete nor selfish, that it may live at peace with its workers, and may serve without exploiting its public.

The volume contains a considerable amount of interest concerning a Company which has had such conspicuous part and place in the making of history in our industry.

* "Industrial Co-Partnership," by Dr. Carpenter; 3rd edition, p. 47.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

HALF-YEARLY MEETING AT NEWARK.

THE first meeting of the Association to be held in Newark took place last Wednesday, when the members attended in very satisfactory numbers to do honour to their President, Mr. F. A. West, who is Engineer, Manager, and Secretary to the Newark Gas Company. The day was full of interest and enjoyment, as also was the visit to Chesterfield on Thursday.

The day opened with the reception of the members by the President at the gas-works, where they were able to see for themselves much of the good work that Mr. West has been, and still is, doing for his undertaking.

At the Gas-Works.

In anticipation of the visit, an illustrated booklet containing a history and description of the works had been prepared by Mr. West, from which the visitors gleaned much information. The Newark Gas Company was formed in 1832, and the original works were built by Mr. James Malam. The site of the present works, which is adjoining the original works, was purchased in 1883, and a new works constructed by Mr. T. Hawksley. The site is divided by a public roadway; the manufacturing and purifying plant being on one portion, and a holder and the distribution department on the other. From Jan. 1, 1924, the Newark Corporation took-over the undertaking; and the transfer will probably be completed this year.

A branch siding has been carried into the works from an adjoining L. and N. E. Railway coal siding. All the coal is obtained by rail; the trucks being shunted direct into the siding by the Railway Company. The coal is simply discharged from the trucks by bottom or side doors into an underground hopper, which discharges into a four-roll breaker, and elevated by a 20-ton an hour bucket elevator on to a band conveyor, which discharges into the overhead hopper in the retort house. This hopper holds about 24 hours' supply. A by-pass shoot has been arranged in the breaker pit to by-pass small coal which does not require breaking, and a two-way shoot has been constructed at the top of the elevator, so that in the future coal can be discharged on to conveyors for trimming coal into stores. The coal stores adjoin the retort house. Provision is made for about one month's winter requirements, half under cover and half in the open.

The carbonizing plant consists of four beds of eight retorts (Drake's settings) arranged in four tiers, with a blank arch for future extensions. The retorts are 23 in. by 16 in. by 20 ft. long, and arranged with 7-in. ascension pipes both sides of the beds. The dip-pipes are fitted with Cort's anti-dip valves; and the hydraulic mains are separate and fitted with the ordinary tar towers, each side of the bench. The foul mains, which are 18-in. diameter, converge into one common main at the end of the beds; and a Cowan retort house governor regulates the vacuum on the retorts. Charging and discharging the retorts is carried out by a Guest-Gibbons combined machine.

Hot coke is removed by a side-tipping wagon running on rails and hauled by an endless rope and electric motor. This is controlled by a tramway-type controller in the retort house. After it is quenched, the coke is drawn up an elevated gantry, and the wagon automatically tips either into the coke bunker or at any desired spot in the yard. Another transporter running at right angles, and electrically driven, conveys coke from the bunker to railway wagons. This transporter is also used for storing coke when required.

There are 750,000 c.ft. water-tube condensers, fitted with 18 in. connections. The exhauster house contains two sets of exhausters—one 50,000 c.ft. per hour by Messrs. Bryan Donkin, and the other 40,000 c.ft. per hour by Messrs. Geo. Waller & Son. The exhausters are direct coupled and steam driven. There are also two Evans ammoniacal liquor pumps for circulating the liquor round the works, and an Evans reversible tar pump for filling tank wagons at the sidings. There are two tower scrubbers 40 ft. high and 10 ft. diameter, filled with wood boards on edge. One is used with ammoniacal liquor, and one with clean water. There is also a Livesey washer, with a capacity of 1 million c.ft. per day.

The purifiers consist of eight boxes: Four small water-lute purifiers 10 ft. by 15 ft. (worked as two, the gas dividing into two streams); two luteless boxes 20 ft. by 15 ft. (all under cover, and worked by a patent Saddler-Cockey centre valve, allowing one, two, three, or four boxes to be in operation at once); and two boxes in the open, 25 ft. by 25 ft. by 5 ft. 6 in. deep, operated by a Weck valve, at present acting as catch boxes. Ultimately there will be added two more purifiers of the same capacity, to form the main purifying plant, with the two smaller luteless purifiers used as catch boxes. The method of working is the backward rotation system; all the boxes being in operation. The oxide in the larger boxes is changed once a year, and put in the boxes in one layer only. The portable oxide disintegrator is capable of dealing with 2 tons of oxide per hour, and is direct driven by an electric motor.

The station meter is a Venturi meter by Messrs. Geo. Kent, Ltd., and has a capacity of 60,000 c.ft. per hour. The town governor is housed in the same building, and is an 18-in. governor, made by the Gas Meter Company. The building also contains all the works gauges, recording and direct reading, the recording calorimeter, &c.; the general arrangement making a central control room.

The water gas plant house contains two sets of Tully plant, each of 300,000 c.ft. capacity. One is fitted with a carburettor for lightly carburetting with oil; Hodges steam turbine blowers in duplicate are used for the air blast; and there are two circulating pumps and a vertical Marshall steam engine, for driving the elevator, in the engine house adjoining. Two scrubber condensers and a Livesey type washer are used for cooling and washing the gas.

The tar and liquor well is constructed at the end of the retort house; and an overhead cast-iron tank is used to store tar. A tar dehydrating plant was erected out of old material on the works, and is very simple and efficient. There are three holders—No. 1, 530,000 c.ft. capacity, with flying lift; No. 2, 175,000 c.ft. capacity; and No. 3, 100,000 c.ft. capacity (the relief holder for water gas).

There are two Lancashire boilers, adjoining the engine house. They are 7 ft. diameter and 27 ft. long, fitted with Wilton forced draught furnaces. The boiler house is equipped with a Lassen and Hjort water softener, two boiler feed pumps, and a feed water heater. The electric generating plant adjoins the boiler house and exhauster house, and consists of one 16 KW. set, direct coupled to a "National" gas engine; and one 25 KW.

COKE HANDLING PLANT.

set, direct coupled to a vertical compound Sisson engine. In this room is also housed a small Bryan-Donkin compressor for atomizing a suitable paraffin for naphthalene. There is a pan-breeze washer of a new type, very simple and effective, operated on the flotation principle, and made locally by the Midland Iron-Works Company, Ltd.

A fully equipped laboratory has been provided; and there are meter repairing and fitting and stove cleaning shops.

Town water is used in the condensers, and then passed to a water softener, after which it is used in the boilers. A well in the works supplies the water for quenching coke; the waste being recovered and employed over again. This water averages 60° hardness, and is not suitable for boilers.

The offices are at the works. A new showroom has recently been opened in the Market Place. A full assortment of appliances is on view, and consumers have proved that they fully appreciate the convenience of a central showroom.

Luncheon.

Subsequently a move was made to the Clinton Arms Hotel, in the Market Place, where the visitors were the guests at luncheon of the Chairman and Directors of the Newark-on-Trent Gas Company. Between fifty and sixty sat down, under the chairmanship of Mr. O. Quibell, F.C.S., J.P. (the Chairman of the Company). He was supported by the majority of the Directors and of the members of the Town Council, who, as already stated, have agreed to take over the undertaking. Among the members of the Association, many old friends were found; while the visitors included Mr. Walter Dunn (Secretary of the Institution of Gas Engineers) and Mr. W. M. Mason (Manager of the British Commercial Gas Association). After the honouring of the Loyal Toast,

The Chairman said it was a great pleasure to him, on behalf of the Directors of the Newark Gas Company, and of the Committee of the Town Council (who would manage the gas-works when they had taken possession of them), to welcome the Association to Newark. The pleasure was all the greater in view of the fact that Mr. West was their President. The members probably knew and appreciated Mr. West as much as they in Newark did. The Directors felt that they were under a great debt of gratitude to him. It was a fact that if gas undertakings prospered, then the communities they served would benefit from their prosperity. He had been looking over the old minute books of the Company, and found that they started with a capital of £5000, and that there were then eleven Directors. There was a minute proposing that the price of gas should be reduced from 10s. to 8s. 4d. per 1000 c.ft.; and a year or two later the contract price for coal was 8s. and 9s. per ton. The sum of £11 was received for a year's supply of ammoniacal liquor; and following this, £15 a year for seven years. The firm with which he had been connected had had the contract ever since then, with the exception of one year. Another item he came across was: "Unpalatable as the contents of this report must necessarily be, there are no grounds for discouragement. Uninterrupted prosperity is not the portion of any human institution." Again—and this was after the Directors had held several meetings to discuss various improvements needed at the works: "The Committee, acting in the same cautious spirit, have avoided laying-out any money in improving the works."

Mr. W. W. Townsend (Colchester) proposed "The Newark Gas Company—Our Hosts To-day." He remarked that the gas industry had to meet acute competition, even in connection with the tarring of roads, and it was necessary for them to consider how best to meet the competition of various road compounds. It was a great pleasure to come to Newark, and they all felt that it was well worth while, if only for the visit to the works. He believed it was the first time the Association had been to this interesting old town. It was rather in a corner of their district, but the members had assembled in big numbers to do honour to their President. They had been much struck by what they had seen at the works. In fact, he himself did not remember to have seen a better works of the size. Mr. West had had a great deal to do with carrying out the various alterations, which revealed much originality. The Town Council were acquiring a works which were well equipped in every way.

The Chairman suitably acknowledged the toast.

THE BUSINESS MEETING.

The business meeting was subsequently held in the hotel—the President in the chair.

Confirmation of Minutes.

The President said the first item on the agenda was the confirmation of the minutes. These had been published in the Technical Press, and in accordance with custom would be taken as read.

Their confirmation was agreed to.

Letters of Regret.

The Hon. Secretary (Mr. W. H. Mainwaring, of Lincoln) announced the receipt of several apologies for absence. Mr. J. Ferguson Bell had written regretting that he could not attend, as he was busily engaged in connection with the impending meeting of the Institution of Gas Engineers.

Government and the Electricity Supply Industry.

The Hon. Secretary said he had received from the Manchester District Institution of Gas Engineers a copy of the following resolution passed by them at their last meeting; and they asked the Eastern Counties Association to endorse it.

> "Having regard to the national importance of the gas industry, and particularly to the service it renders in conserving the coal supplies of the country, this meeting views with concern the reported proposals of the Government for financial assistance for the electricity supply industry, and urges the National Gas Council to take such steps as will ensure the full consideration by the Government of the claims of the gas industry, and suggests that all undertakings should be advised at some opportune time to appeal for the support of Members of Parliament representing the districts within their area of supply."

The President remarked that, as they were all aware, the National Gas Council had this matter in hand, and were doing excellent work; but he did not think it would do any harm if the Association passed this resolution.

Mr. R. G. Shadbolt (Birmingham) said he would like to propose the adoption of this resolution, as in this way they would be strengthening the hands of the National Gas Council, who were fully alive to the situation. Only that morning he had come across the following reference in a newspaper:

> "Speaking at Dovercourt, yesterday, Mr. Moore Brabazon (Parliamentary Secretary to the Transport Ministry) said he was the Minister charged with electricity. The Government were giving the question serious consideration, and, while not promising a land flowing with milk and honey, would do their best to make it a land flowing with volts and amperes."

The members might rely upon it that the National Gas Council were doing their best to put matters in the right light.

Mr. J. Wilkinson (Nottingham), in seconding, said he would like for a moment to refer to another aspect of the question which he did not think had been appreciated by the gas industry as a whole. This was that the electrical industry generally was able to purchase its fuel at a very much lower price, grade for grade of fuel, than the gas industry. He did not know why it was, and he must confess that he was astounded to find such a state of affairs existed. How was it that the electricity industry was able to purchase a 2 in. by 1 in. nut at from 4s. to 7s. per ton less than the figure at which the gas industry was able to procure a similar coal? The only explanation the colliery company could give was that the coal was from a different seam. But it was costing the colliery company just as much to produce. For the last two years, or even longer, the electrical industry had been able to purchase fuel, similar to that of the gas industry in grade, though possibly from another seam, at from 3s. to 5s. a ton less than the gas industry had paid.

The resolution was agreed to.

An Employment Register.

The Hon. Secretary next announced the receipt of the following letter from Mr. W. T. Dunn, the Secretary of the Institution of Gas Engineers.

> At the last meeting of the Council, it was unanimously resolved that there should be established in connection with the Institution a register for the assistance of those members of the Institution out of employment.
>
> I was directed to convey to you this information, with a view to your kindly informing all your members of the fact, so that the register may be of real use to those for whose benefit it is intended.
>
> The Council will greatly appreciate the assistance of your Association in this direction.

As Mr. Dunn was present, perhaps he would kindly explain the proposal to the meeting.

Mr. Walter Dunn said the Council of the Institution of Gas Engineers regarded this as a very important matter. They desired that the Institution should be of the greatest possible value to the members. This proposal, he thought, would meet with general approval. Of course, the scheme was intended for members of the Institution. Naturally, those who joined the Institution and supported it with their contributions were those who should benefit from any movement of this kind. The register was not intended for those who wished to improve their present position, but for those who were actually out of employment. The question was how best the Institution could help such members. They might do it in various ways with the assistance of the members themselves. Many members would know of appointments becoming vacant, and might be kind enough to advise him of the fact. For a long time he had kept a register of those out of employment; and if they could be provided with appointments, the Institution would be doing a real service.

Mr. J. Wilkinson remarked that this was a serious attempt on the part of the Institution to help those who, through no fault of their own, found themselves out of employment.

Mr. P. D. Walmsley (Great Yarmouth) said he was in the fullest sympathy with all that had been said in this connection. Every assistance should be afforded to members who, from causes perhaps outside their own control, found themselves temporarily out of employment. It was very desirable that the Institution should recognize this as one of its duties to its members; but there was a very important reservation he would make. Without going into any further details, the members of the Institution must recognize that there were from time to time certain members who were, through their own fault, in the ranks of the unemployed. Not one of them had any desire to hit a man when he was down; but, without saying more, he submitted that it would be very dangerous to let the idea go forth that, because a member had his name put on such a list, this was tantamount to the Institution guaranteeing his integrity and suitability for a position for which he was an applicant. It was a delicate subject; but he trusted members

would appreciate his meaning, and accept his remarks in the spirit in which they were made.

Mr. Dunn replied that the Institution would not accept responsibility in regard to any member whose name might be put forward for an appointment. His *bona fides* would have to be inquired into by those contemplating employing him.

Wembley.

Mr. W. M. Mason (Manager of the British Commercial Gas Association) addressed the meeting on the subject of the forthcoming Gas Exhibit at Wembley. The decision to take part in this year's Exhibition was, he said, come to after the fullest consideration by a thoroughly representative meeting; and the main thing which weighed with the members present at the meeting referred to, and which had continued to weigh with the leaders of the industry, who had practically unanimously agreed to go on with Wembley again this year, was the competition of electricity. There was electrical competition going on all over the place. If it was straight competition, however, it would be all right; but it was backed by the chief political parties. This meant that the gas industry was at stake, and that it absolutely must pull together and subscribe together. If the politicians and the electricians had their way, there would in time to come be no place at all for the gas industry. It was essential that they should present a united front. The Eastern Counties, as a district, were doing splendidly; but they could do still better if all, big and small, united to this end.

New Members.

On the proposition of Mr. R. J. Calderwood (Spalding), seconded by Mr. R. Wardell (Peterborough), the following were added to the roll:

Members.

Mr. A. O. Snell, Maldon.
Mr. R. Bowden, Lincoln.

Associate Member.

Mr. A. J. Underwood, Showroom Manager, Braintree.

Annual Report and Accounts.

The President remarked that the annual report and balance-sheet had been circulated among the members, and were submitted by the Committee for adoption, with a recommendation that five guineas be paid as a donation to the Benevolent Fund of the Institution of Gas Engineers.

The report and accounts were adopted, on the motion of Mr. J. H. Dougall (Boston), seconded by Mr. G. A. Mallett (Ipswich).

Presidential Address.

Mr. West then delivered his Presidential Address, which will be found on pp. 237-240 of the "Journal" for April 22.

Mr. W. W. Townsend (Colchester) proposed that the best thanks of the Association be tendered to the President for his most interesting and illuminating address. He had taken a very wide sweep, and had given them food for thought in many directions. On the whole, there would be agreement with the arguments he had advanced. The address, and their visit to the works, revealed Mr. West as a thoroughly up-to-date gas engineer. The simple, quiet, and effective coke plant introduced by Mr. West at the gas-works must have struck many of them. He was also to be congratulated upon the even chart he had produced of the gas sent out. The admirable and well-equipped showroom in the Market Place showed, again, that the undertaking was alive to its responsibilities, and to the need for showing the public what could be done with the aid of gas.

Mr. Shadbolt said he would like to second the vote, for the reason that he had personally known the Newark gas undertaking for the last thirty years, and had seen it progress from a very backward condition to the excellent position it occupied now. The circumstances when Mr. West took up his appointment at Newark were abnormal in many respects; and these abnormal conditions accounted for many of his difficulties. The President was one of those optimists who were so necessary to gas administration at the present time. Certainly there was every reason for them to be optimistic, when they took into account the vast possibilities of their industry. The President was well equipped in every way to deal with the problems that confronted him; and they would be doing less than their duty if they failed to record their hearty appreciation of his services both to the Association and to the industry.

The President expressed his gratification at the kind way in which they had received his address, and at the nice things that had been said about him. It was a difficult thing to write a presidential address; but he had felt for some time that they were as an industry very much inclined to leave things to the National Gas Council, the "B.C.G.A.," and the various other organizations. If each one would strive his utmost to help in the good work, not only by giving subscriptions, but by "doing his little bit" in his own way, it would be much to the good of the industry. As an industry they must stand together as firmly as possible. They had to fight, and fight hard; each one must do his share of the fighting.

Gas for Industry.

Mr. C. Bryan Donkin (an associate member of the Association) read a paper on "Gas for Industry." This will be found on p. 312.

New Office-Bearers.

The following office-bearers were next elected:

President.—Mr. Frank Prentice, Ipswich.

Vice-President.—Mr. J. B. Hansford, Bedford.

New Members of Committee.—Mr. H. C. Smith, Tottenham; and Mr. E. W. Smith, Chelmsford.

Auditors.—Mr. G. A. Mallett, Ipswich; and Mr. W. S. Venner, Brentwood.

Hon. Secretary and Treasurer.—Mr. W. H. Mainwaring, Lincoln.

Mr. J. W. Auchterlonie (Cambridge), proposing Mr. Frank Prentice as President for the ensuing year, said they were all extremely pleased that this gentleman had at last consented to take office. In honouring him, the Association would be honouring themselves. Mr. Prentice had occupied a very prominent position as Chairman of their Regional Council, and in that work had given great satisfaction. That he would do equally well as their President, all were firmly convinced.

The motion was seconded by Mr. H. G. Ruggles (Leighton Buzzard), and carried with acclamation.

The Hon. Secretary and the Auditors were heartily thanked for their services; the President remarking that the success of the Association depended more upon the Hon. Secretary than anyone else. Mr. Mainwaring devoted a tremendous amount of time to the work.

Place of Next Meeting.

It was agreed to leave the Committee to determine the place of next meeting.

Representative on the Institution Council.

On the proposition of Mr. S. Hands (Sleaford), the President (Mr. West) was elected to represent the Association on the Council of the Institution of Gas Engineers.

This concluded the business, and the members and friends thereafter took tea together.

ANNUAL DINNER.

In the evening members and guests assembled in goodly numbers in the Clinton Arms Hotel, where the annual dinner took place. The President was in the chair, and was supported by Directors of the Gas Company, by the Vice-President (Mr. F. Prentice, of Ipswich), members of the Committee, and several Past-Presidents. The Mayor of Newark (Councillor W. K. Clarke) was there, with Alderman L. Priestley (the Chairman of the Corporation Gas and Electricity Committee), and other prominent townsmen; and so also were Alderman J. Clark, J.P. (of Chesterfield), Mr. W. T. Dunn, and Mr. W. M. Mason. A thoroughly enjoyable evening was spent in toasting, music, and song. The Loyal Toasts having been honoured at the call of the President,

Mr. J. C. Kew, M.B.E., J.P. (a Director of the Newark-on-Trent Gas Company), submitted "Success to the Eastern Counties Gas Managers' Association." He understood that the President earlier in the day had given them some very good advice on the value of advertising; and he wished to reinforce this advice, because he was sure they would benefit if, in the towns and cities from which they came, they used the local Press in order to advertise their commodity. In the fight which they were waging against electricity, they would have to take all possible steps to make known the virtues and the capabilities of the product which they were so excellently providing; and—speaking, as he did, as a newspaper proprietor—he had no hesitation in saying that they could not do better than utilize the columns of the local Press. His only fear was that when the Newark Gas Company were taken over by the Corporation, it might be thought that the time for advertising was past. He hoped that this would not be so, and that the new owners would take to heart the advice of the President in this respect. It was his pleasure to couple with the toast the name of the President; and if he were to say all he could say, all he ought to say, and all Mr. West deserved, he would keep them listening a long time. In their President they had a very able gas engineer—one whose qualities were many-sided, who had made his name in Newark, and who had rescued the gas-works from a very derelict condition and brought them into a state of considerable efficiency. As Directors, they had great confidence in Mr. West; and they felt that they had cause to be grateful to him for remaining in Newark. The reason must be that Mr. West, having started to "put their house in order," to reconstruct the works, and to bring the undertaking into a state of the highest efficiency and dividend-earning capacity, wished to see the work finished before he passed on. He hoped that under the new ownership Mr. West would find himself on "a bed of roses," and that Newark would succeed in retaining his services for many years to come.

The President, in response, said the Association, in common with the other District Associations, played a very important part in the organization of the gas industry, and were undoubtedly of help to the parent Institution as well as to the various engineers who were members and to the undertakings they represented. He well remembered many years ago the new manager of a very small works coming over to where he (the President) was engaged, to gather some information. It was a wet day, and he took off his coat and placed it on the governor, thereby affecting the pressure. He was told about it, and he said: "I have not got a governor. What I want to know is whether you push or whether you pull." If that gentleman had been a member of one of these Associations, he would probably have got more information in a very short time than he could easily have assimilated. The Association had been very successful in the

past, and he hoped that it had very many years of usefulness before it. Certainly, it was very gratifying to reflect that they had still three of the original members with them—Mr. H. Wimhurst, of Sleaford; Mr. J. Barton, of Peterborough; and Mr. E. J. Brockway, of Cleethorpes—and he hoped they might long be spared to remain members. This was the first occasion on which Newark had been honoured with a visit by the Association; but he hoped that the Corporation, as the new owners of the gas undertaking, would one day entertain them again, when the cycle of works in the area had been completed.

Mr. F. Prentice proposed "The Newark Gas Company," and coupled with the toast the name of Mr. W. A. Ferrier, one of the Directors. One of the most amazing things, he said, connected with the gas industry was the success which attended it—and this in spite of its "enemies," electrical or otherwise. Perhaps electricity had been rather a friend to them, because it had awakened them and increased their efficiency. As a matter of fact, electricity and gas should run hand in hand; for there were things that electricity could not do advantageously which gas could, and the exact opposite was also the truth. A vivid illustration of the extraordinary vitality of the industry, they had before them in the Newark Gas Company. Under the wise administration of the Board, and more particularly under the skilful management of their President, the undertaking had made remarkable progress. In one respect especially he wished to pay tribute to Mr. West. He had seen a good deal of him in London in connection with some of the national organizations, and his wise judgments and sane counsels were always highly appreciated. He ventured to think it would not be very long before the President made a mark in the industry of which they would all be very proud.

THE HUMAN ELEMENT.

In the case of gas companies it was of vital importance to deal fairly and justly with three sets of people. First came the consumer. It was of supreme importance that consumers should be satisfied and contented; and some of them, as they well knew, were not. Then one of the main qualifications in these days for a gas engineer was to know how to handle men. The working men of to-day were getting more and more difficult to handle; they needed almost a special study. It must be remembered that the men were being bombarded by fantastic nonsense, which was poured into their ears by agitators whose very existence depended upon the gap which existed between employers and employed. If he himself had the appointing of an engineer to a works of any importance, the question to which he would first endeavour to secure an answer would be, not how many examinations he had passed, not what letters he could put after his name, but if he knew how to handle men. ["Hear, hear."] This knowledge was an invaluable asset to a gas engineer, without which all the skill in the world was of little avail. Thirdly, there was the shareholder to consider. From the limited observations he had been able to make of the working of the Newark Gas Company, it seemed to him that they had succeeded in dealing fairly and justly with these three important sets of persons.

Mr. W. A. Ferrier, replying, said all who had seen the works would realize how greatly indebted to Mr. West the Company were; and, speaking for the Directors, he could say they did not feel at all ashamed of the state in which they would be handing over the works to the Corporation. Thanks to Mr. West, they were in the high state of efficiency which had been so flatteringly referred to during the day. The ability to understand human nature was one of the main things that led to the success of any business. The initiation in Newark of a system of inspection for each individual householder had been followed by a great increase of business; and the demonstration showroom had been a wonderful success. By paying attention to little things, much satisfaction was given to the consumers. The Company had been prompted to enter into negotiations with the Corporation for the sale of the undertaking by the feeling that public utility concerns should be in the hands of the local authority. There had been ambitious ideas regarding the introduction of electricity; and he hoped that when the present state of suspension passed away, the supply of electric current in bulk to the town would enable the Corporation to give a good service of both gas and electricity with the staff which was now in existence, thus enabling them to operate the two undertakings at a minimum cost, to the advantage of the town. This he would say to the Corporation: "Retain, if possible, the services of Mr. West." ["Hear, hear."]

Mr. Thomas Glover, C.B.E., M.Inst.C.E., proposing "The Town and Trade of Newark-on-Trent," said they were all conscious that they had met that day in a very interesting and ancient town; and at the same time they felt that they were in not only an historic town, but one which was modern in regard to its industries and its trade. For nearly 400 years Newark had had a charter of incorporation. They were honoured as an Association in having with them his Worship the Mayor, Alderman Priestley, and others.

The Mayor, in acknowledgment, said that though the town progressed slowly, still it was progressing, and he thought in the future it would be much more important and prosperous than in the past. He trusted that when the Corporation took over the gas undertaking they would give satisfaction to the consumers, and that the gas might be even cheaper than it was at the present time. The great thing to do was to cheapen as much as possible those commodities that people could not do without. It seemed to him that gas and electricity would run very well together in Newark. A good deal had been said about Mr. West that day. There was no one who more appreciated Mr. West's work and his great ability as a gas engineer than he (the Mayor) did; and he hoped the Corporation would retain his services.

Mr. E. F. Keable submitted "The President"—a charmingly unassuming man who was greatly admired by all of them. During their visit to the works they had seen much which reflected credit both on the Directors and on Mr. West.

The reply of the President brought to a close the first day's proceedings of a wholly successful meeting.

THE BRYAN DONKIN COMPANY.

Equally well arranged and attractive was the programme for the following day, when those members (with a few friends) who had been able to stay in Newark over-night proceeded by motor from Newark Market Place to the works of the Bryan Donkin Company, Ltd., at Chesterfield. With fine weather, the drive through the famous "Dukeries" country of Nottinghamshire, and the return by way of Mansfield, proved most enjoyable. A warm welcome awaited the travellers at Chesterfield, where they were met by their old friend, and genial host, Alderman George Clark, J.P., M.Inst.Mech.E. (Managing Director of the Bryan Donkin Company), and various members of the staff—including Mr. A. G. Webb (Secretary), Mr. Buxton (Works Manager), Mr. Seaman (Chief Draughtsman), Mr. Tucker (Assistant Works Manager), Mr. Cyril Donkin and Mr. Fennemore (District Engineers), Mr. Dickinson, and Mr. Hopkinson (British Furnaces Staff).

Under such able guidance a tour was made of the works, the great extent of which proved a revelation to those visitors who had not seen them previously. Alderman Clark himself was at the head of the parties, and from his wealth of knowledge of the business and the works was able to impart much information during the inspection. Alderman Clark went to Chesterfield from the London works of the Company at Bermondsey in 1900, as Works Manager; and under his control as Managing Director during the past nineteen years, the concern has developed steadily, until at the present time the employees number about 700. Alderman Clark is Chairman of the Gas Committee of the Chesterfield Corporation, and was Chairman of the Society of British Gas Industries in 1921-22. He is also a Vice-President of the British Commercial Gas Association, a member of the National Gas Council, and is on the Grand Council of the Federation of British Industries. He was Mayor of Chesterfield in 1922-23.

History.

The history of the firm goes back much more than a century; the business having been founded in 1803 at Bermondsey, by Mr. Bryan Donkin, F.R.S.; and much varied and valuable work was done right at the commencement, though it is unfortunately impossible to enter into this here. It was between the years 1840 and 1850 that the Company began to devote their attention to the gas industry. In 1847 a special type of valve known as the rack-and-pinion valve was designed at the suggestion of the Chartered Gas Company, of London; and it is still one of the chief products at the Chesterfield works, where over 1000 tons are turned out yearly. Other designs of valves followed for use in different parts of gas-works.

The firm also took up the manufacture of gas exhausters, which has since become such an important section of their business—making what was known as "the 1847 patent." This was afterwards superseded by the manufacture of John Beale's design, patented in 1866. A number of these were made, chiefly in large sizes, and many are running well to this day. They were, however, gradually superseded by a later patent of Beale's, dated 1877, which has many advantages over his earlier efforts, and has come into use more than any other type in Great Britain. A further patent on this design was taken out by Mr. Thomas Donkin's eldest son, Mr. E. Bryan Donkin, who evinced a special interest in this class of machine, and read an excellent paper on the subject at the Belfast meeting of the Incorporated Gas Institute in 1893. He also invented and patented several other improvements in the gas-works apparatus that the firm manufactured, and turned his attention chiefly to developing the business in that direction. He became a partner on the retirement of his father from the business, and was in active control of it for over twenty years.

After a century of eventful history in Bermondsey, the growing interests of the business and the difficulties of transit and expansion on an adequate scale in Bermondsey caused the firm to seek greater conveniences, and the whole concern was removed to Chesterfield. An amalgamation was effected with the firm of Clench & Co., and their well-equipped and modern works taken over and adapted to the combined requirements. The site comprises 14 acres. It is connected by sidings with the London, Midland, & Scottish and the London & North-Eastern Railway Companies, and is in the centre of the great coal and iron district of Derbyshire. Extensions have been continuous, and during the period 1902-25 practically all the departments have been considerably enlarged, until at present the area occupied by the buildings alone is over 4 acres, and the works are equipped with every class of modern machinery. In 1912 the present fine offices were built, the old offices being converted into the general stores. In 1917 a new erecting and testing shop of 7900 sq.ft. area was built, and later a women's canteen of 1440 sq.ft. area. A new fettling shop and sand blast house, a core shop, and works' repair shop have recently been built; and a large ferro-concrete pattern stores in two floors, with a total area of 16,000 sq.ft., is nearing completion. An extension of the valve shop of three bays, each 25 ft. wide by 96 ft. long, has just been started, and further extensions are in contemplation to meet the increasing demand for the Company's specialities.

A "History of Bryan Donkin & Co. (1803-1925)," which is of engrossing interest, has been compiled by Mr. Harry J. Donkin.

Gas Apparatus Manufacture.

The Company have continued at Chesterfield to manufacture their well-known specialities—the positive gas exhauster (which is now made with two, three, or four blades, according to the

EASTERN COUNTIES ASSOCIATION, HALF-YEARLY MEETING.

preference of the gas engineer), gas valves, motor parts, tar and liquor pumps, &c. During this period the usual initiative of the firm in adapting themselves to the changing times has been shown in many ways—notably in the acquirement, from Prof. Rateau, of Paris, of rights in the turbo-exhauster. No less than 183 of these machines are already at work (or on order) in gas works and collieries, and for coke oven installations, doing duty as exhausters, boosters, blowers, &c., representing a capacity of 85,094,166 c.ft. per hour. They can be driven by steam turbine, electric motor, or belt. In addition to high-pressure gas transmission plant, the Company make, under license from the Reynolds Company and the Mueller Company, reducing governors and fittings for district and service purposes. To take the place of the German coke-oven valve, the Company are manufacturing a light pattern valve with internal or external screw, many thousands of which have been sold. A gland plug cock also has been designed, and has met with a large and increasing demand; and the Company are now making a special tar cock for use on tar towers and tanks. In 1921 the firm became interested in British Furnaces, Ltd., who handle every type of heating or fuel treatment equipment as well as small water gas plants and gas-fired boilers. As a matter of fact, some of the furnaces to which Mr. C. Bryan Donkin had referred in his paper on the previous day were seen in operation.

In the huge machine shop, and other parts, a great deal of work of a varied kind for different gas and similar undertakings was noted in progress. To mention some, there was apparatus for the Gas Light and Coke Company, the Birmingham Corporation, the Coppée Company, the Glasgow Corporation, the South Metropolitan Gas Company, the Synthetic Ammonia Company (Billingham), the Aldershot Gas, Water, and District Lighting Company, the Wigan Corporation, the Oxford Gas Company, the Preston Gas Company, the Ripon Corporation, the Liverpool Gas Company, and the Yeovil Corporation, as well as Cambuslang, New Hunstanton, Kenilworth, and Bellshill, and also a number of governors for Copenhagen.

As to the gas type-metal melting installations of British Furnaces, Ltd., it can only be said that the extent to which these have been, and are being, adopted in newspaper and other printing works is remarkable. The particulars of these installations reveal extensive recognition on the part of printers of the advantages of gas in this connection, and a big field of business for the gas industry.

Of all the interesting processes inspected in the works, space will not permit details to be given here. Mould ramming is performed by compressed air machinery of an ingenious character. Bumping machines, sunk in the ground, and also operated by compressed air, attacking the mould from beneath, save a lot of laborious work. Indeed, a principle of the works is labour saving in every possible direction. The core shop has been "manned" entirely by girls for the past twenty and more years. The firm were among the first in England to employ girls for this purpose in an engineering works. It is pleasant work which is excellently suited to female labour. Much attention was devoted to the already mentioned ferro-concrete pattern stores now in course of construction. These were designed, and are being built, by the Company's staff. There is still space on the site for extensions, for which the various buildings have been designed.

Hospitality.

At the conclusion of the inspection, the visitors were the guests of the Company at luncheon in the Station Hotel—with Alderman Clark in the chair. There were also present the Mayor of Chesterfield (Mr. W. E. Wakerley, J.P.), Sir Ernest Shentall, J.P. (a member of the Town Council), Alderman H. Edmunds, J.P., and Mr. Harold Davies (the Gas Engineer). The toast list was of the shortest—"The King," "The Eastern Counties Gas Managers' Association," and "The Mayor and Corporation of Chesterfield."

Submitting the second, Alderman Clark welcomed the Association to Chesterfield, and made reference to his firm's association with no less a person than Murdoch himself. To every gas engineer the name of Murdoch was like a talisman; for he was the father and founder of an industry which, though it had small beginnings, had since grown to such enormous dimensions. Bryan Donkin, the founder of the firm, was born in 1768, at a wonderful period in English history, and was associated with all those giants of science who, without the aid of textbooks, and really of their own knowledge, built the industrial England which existed to-day. In addition to knowing Murdoch, he was connected in business with Telford, Rennie, Bramah, Boulton and Watt, Simpson, Maudslay, Congreve, the two Brunels, and Nasmyth. An entry in Bryan Donkin's diary (under date of January, 1814) had reference to a visit to Boulton and Watt's works at Soho, Birmingham, and was in the following terms:

> "Mr. Murdoch showed me the foundry, which is large enough to melt 30 cwt. of iron at one time. Young Mr. Watt asked me to call on his father (James Watt). Mr. Murdoch accompanied me, and I was kindly received by the old gentleman, who is now 84."

His (the speaker's) firm were proud of their history; not only were they linked with the past, but they were alive to the needs of the present.

The President's reply afforded him an opportunity of gracefully thanking Alderman Clark and the Bryan Donkin Company for all the kindness that the Association had received at their hands.

"The Mayor and Corporation of Chesterfield" was proposed by Mr. F. Prentice and replied to by the Mayor, who stated that the Chesterfield gas and water undertaking was in private hands up to 1895, but was acquired by the town in that year. The purchase money was just under £250,000, and was found by the issue of 2¾ p.ct. stock at a premium of 30s.

Chrisman Down-Run Process.

The down-run process developed under the direction of Mr. C. S. Chrisman, of the U.G.I. Contracting Company, and applied to a carburetted water gas set, has been described, in a paper presented to the Pennsylvania Gas Association, by Mr. L. W. Seltzer, the Engineer to the Reading (Pa.) Consumers' Gas Company. The process is one by which all the gas made on the down run is taken from the bottom of the generator, and led to some point beyond the superheater but ahead of the wash box, thus making the down-run gases by-pass the carburettor and superheater. The idea is based on the fact that the gases made on the down run leave the generator at a very much lower temperature than either the blast or the up-run gases, and that this temperature is far below that required in the carburettor and superheater for efficient oil results. These comparatively cool gases by-passing the carburettor and superheater prevent the unnecessary abstraction of heat from the plant, and the correct temperature for efficient oil fixing can be maintained with a decreased fuel consumption. For the purpose of properly carburetting the gas, it becomes necessary, with this process, to use oil during the up run only. The Gas Company at Reading have used this method of gas making, with a decrease of from 2 to 3 lbs. per 1000 c.ft. in generator fuel, and a considerable increase in the capacity of the set.

GAS FOR INDUSTRY.

By C. Bryan Donkin.

[A Paper before the Eastern Counties Gas Managers' Association, April 22.]

The use of town gas for industrial heating purposes is a subject of interest to every gas manager, as it is adapted to every purpose where heat is required. Even the smallest town nowadays boasts at least one garage where gas can be used for brazing, hardening tools, and other purposes; while its uses in the larger towns and cities are innumerable. I believe that the British Commercial Gas Association have a list of about 3000 distinct trades in which gas is employed. I propose dealing with this subject as far as possible from the gas managers' point of view, bringing forward those arguments for its use in preference to other fuels, which should appeal to the prospective consumer.

The movement now in existence for promoting means of eliminating the contamination of the atmosphere by smoke is a great point in favour of the use of gas, especially in our cities where fog is prevalent; but an even greater advantage is the improved conditions of the workers in those factories employing gas fuel, resulting in better work and greater output. In order to appreciate this, it is only necessary to visit, for instance, a foundry or printing works using gas, and to note the clean surroundings, free from smoke and dust, and the normal temperature of the shops.

The economy of gas does not lie in fuel cost alone. Gas is delivered to the point where it is to be consumed; coal or coke has to be carted, and the ashes have to be removed. No space is required for storage—an important matter in many works where ground space is limited. Labour costs are saved, as no stoking is required. There is no waste of fuel, for gas can be shut off as soon as it is not required. Temperature can be controlled exactly, and heat applied where it is wanted. Labour is saved in cleaning the workshops, as there is no smoke or dust. All these facts should be taken into account when comparing fuel costs. In addition, it is often possible to increase output of a furnace by converting it to gas; fewer furnaces then being required for a given output.

During the war, when furnaces were required quickly and in large numbers, there was no time to go into questions of design and efficiency. Consequently consumers got the impression that gas was an expensive and inefficient fuel. However, very great advances have been made in the scientific design of the gas furnace; and gas can now show efficiencies far greater than other fuels. In order to employ it economically for heating purposes, there are three important points to bear in mind. The first is that the gas and air must be thoroughly and intimately mixed in the correct proportions, and this mixture must be kept constant under all conditions. The second is that this gas-air mixture should be completely burned under conditions producing the greatest amount of heat, and this heat applied in the most efficient manner. The third is that the furnace itself should be properly insulated, for every unit of heat radiating to the surrounding air is so much loss.

Taking the above points in order, it is necessary that either the gas or the air should be under pressure. If high-pressure gas is used, it may be compressed up to 5 to 10 lbs.; if the air is compressed, about 1 lb. is sufficient. There are various methods of mixing the gas and air; one of the simplest being by means of an inspirator (fig. 1). This is essentially a throat

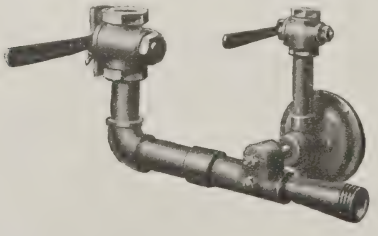


Fig. 1.

of venturi form through which the air from the blower passes, inspirating the gas, which is kept at a constant pressure by a governor. With these inspirators the gas and air are thoroughly mixed, and the proportions are kept constant within 1 p.ct. over large ranges of volume. Thus only one valve is required to regulate the temperature, and the most economical combustion of the gas is ensured. For gas under pressure, a somewhat similar inspirator is used (fig. 2). In this case the governor is not required, as the gas inspirates the air.

Having got the proper air-gas mixture, the next question is how to burn it efficiently and completely so as to produce the

Fig. 2.

maximum amount of heat. Of many methods, one of the most interesting is the so-called surface-combustion system. Fig. 3 shows a furnace in which there are two burners set at an angle, and from them issues the air-gas mixture at such a speed that it cannot light back. This mixture is forced into beds of broken refractory material, where it loses its velocity and burns on the surface, raising the beds to a high temperature without any visible flame, the heat being reflected on to the work from the furnace walls and arch. A perfectly even temperature is obtained over the whole of the interior of the furnace, and it is possible to carry-out the most delicate work without the use of a muffle.

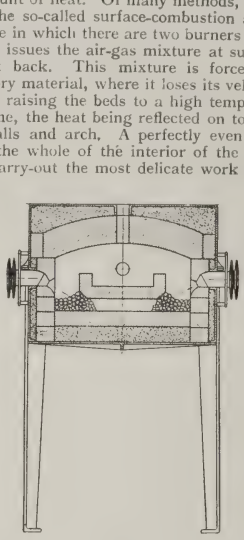


Fig. 3.

The question of insulation has not had the attention it deserves—partly, perhaps, on account of cost; but it is true economy in the end. The refractory lining of the furnace is not usually a good insulator, and it is necessary to back it up with some material having low heat-conducting capacity. Increasing the thickness of the firebrick walls is not of much use; and it is the special insulation that increases the first cost. The applications of heat in industry are so numerous that I can only describe a few of the most common.

The type of furnace just described may be used for tool hardening, annealing, billet heating, refractory testing, pottery baking, &c.

Galvanizing is an important industry, and gas is especially suitable for heating the baths. Fig. 4 shows how the bed of refractory material is arranged along the sides of the bath; the

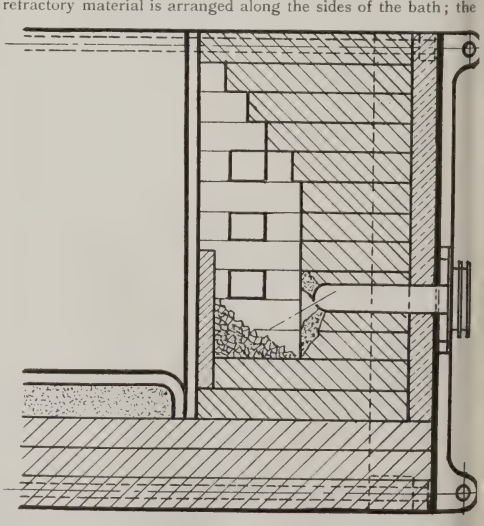


Fig. 4.

ower part being protected by an insulating wall, so that it is ot heated below the normal dross level. This results in per- ectly even heating with no "hot spots," a great reduction in ie amount of dross, and increased life of the bath. It is diffi- ult to give gas consumptions, as conditions vary so much; but ie following figures taken from a bath in actual use may be f interest:

Size of bath, 6 ft. 6 in. by 5 ft. 6 in. by 3 ft. 6 in.
Throughput, 30 cwt. of sheets per hour.
Gas consumption, 3200 c.ft. of 425 B.Th.U. gas per hour.

To keep the bath molten during stand-by periods, 500 c.ft. f gas per hour is required. When a galvanizing bath is con- erted from coke firing to gas, it is usually possible greatly to

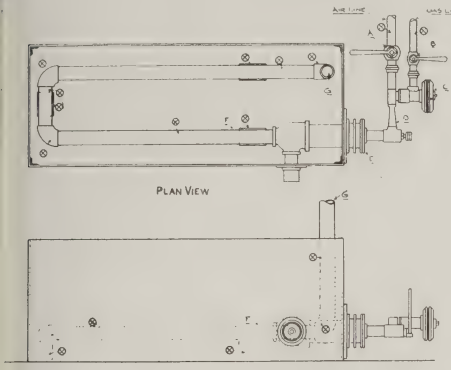


Fig. 5.

ncrease the output; or, conversely, if a gas-fired bath is in- talled, a very much smaller one will do the work.

The use of gas in newspaper printing works is rapidly in- reasing, as the proprietors are beginning to realize its advan- ages; there being no smoke or dust to interfere with the elicate printing machinery. The type-metal pot is heated by urners supplied by the gas-proportioning system; and the out- ut from this type of furnace is very much greater than if olid fuel were used. During stand-by periods the metal is ept molten by an atmospheric burner; the pot thus being al- ways ready for work. For type-metal melting it is always dvisable to have a pot suitable for the normal output, as the as consumption does not increase so rapidly as the output of netal. Therefore a large pot working at a small output is elatively inefficient. Given a furnace of this type working omewhere round its normal output, it is possible to melt over lbs. of metal per c.ft. of gas. This system is, of course, par- icularly suitable for autoplate machines. Gas is also especi- lly suitable for aluminium casting, on account of the freedom rom oxidation; and it is now used exclusively by some of the argest aluminium foundries in this country.

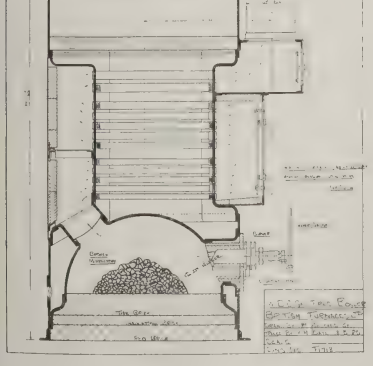


Fig. 6.

In many industries tanks of liquid are required to be kept heated; and the immersion burner (fig. 5) is particularly suitable. The illustration is of a 300-gallon tank, 78 in. by 30 in. by 30 in., with a 4-in. coil.

The burner is arranged in a pipe which enters the tank through one end and is carried round three sides and vertically up. The gas-air mixture being burned inside this pipe, the contents of the tanks are heated without loss by radiation, except from the liquid itself. There is no exposed flame, and the system is very suitable for chemical works, breweries, &c., and with special chemical mixtures for cleaning motor parts in car factories, or cooker parts in gas-works. This should be of special interest to gas managers.

Some processes require small quantities of steam; and the gas-fired boiler supplies a distinct need, as no stoking is required and there is no coal or ash to be carted. For many manufacturing processes it will be found that gas, bearing in mind the collateral advantages, can compete economically with other fuel for steam raising. These boilers can safely be controlled automatically; the steam pressure regulating the burner, and the water level the feed pump. No attendance therefore is required.

Fig. 6 is a section of this boiler showing the refractory bed; the burner being fitted to the fire-hole door. Tests show that an evaporation of 30 lbs. and over is obtained per sq. ft. of heating surface in the combustion chamber.

The following is the result of two tests carried out on two different boilers:

Number of test	1	2
Date	July 21, 1924	Oct. 25, 1924
Heating surface, about	150 sq. ft.	50 sq.ft.
Gas at 60° Fahr. and 30 in. used per hour	3378·32 c.ft.	1078·62 c.ft.
Calorific value of gas (net)	419 B.Th.U.	446·5 B.Th.U.
Amount of water evaporated per hour	1062 lbs.	366 lbs.
Temperature of feed	60° Fahr.	55° Fahr.
Steam pressure per sq. in.	103 lbs.	69·33 lbs.
Barometric pressure, per sq. in.	14·56 lbs.	14·85 lbs.
Heat utilized per hour	1,232,345 B.Th.U.	425,450 B.Th.U.
Heat available per hour	1,415,516 B.Th.U	481,604 B.Th.U.
Net efficiency of boiler	87·07 p.ct.	88·34 p.ct
Temperature of products leaving boiler	403° Fahr.	398·3° Fahr.
CO_2 content of products	11·3 p.ct.	—
Amount of water evaporated from and at 212° Fahr. per sq. ft. of heating surface	8·46 lbs.	8·75 lbs.

Rivet heating is another application for gas, and has the great advantage that the rivets can be uniformly heated without the formation of scale, for, with the proportioning inspirators described, the atmosphere of the furnaces can be set exactly. This question of scale is very important, for, if there is no scale on the rivets, caulking is avoided, thus saving time and labour. The rivet heater is fitted with two burners at the top which are supplied with the correct gas-air mixture by an inspirator. The rivets are fed into a hopper at the back which also acts as a pre-heating chamber, thus utilizing the waste heat. In those works where there is a high-pressure gas pipe- line, the heater can be used as a portable unit with a flexible gas pipe connection.

For the process of steel hardening there are two methods, heating in an open furnace and quenching in water or oil, and the pot hardening system. The furnace shown in fig. 3 is very suitable for the first mentioned, as the atmosphere can be set so that no scale is formed. In the United States the pot hardening system has now come into general use; and it is beginning to attract attention in this country. The furnace in this case is circular; the burners being set tangentially at the top, so that the hot gas swirls round the outside of the pot, heating it evenly. As with this system there is no flame contact, the pots have a long life. Barium chloride and other special hardening mediums are used; and it is claimed that the results are more even and uniform than those obtained in an open furnace or muffle.

Further examples of gas heating for industry are: Forge fur- naces, rod heating, shipyard furnaces, plate heating, case har- dening, annealing, tinning, cone fusion for testing, and brazing torches, &c.

This question of industrial gas heating is one which deserves the closest possible attention by gas managers. Every oppor- tunity should be taken of replacing other fuels by gas, as it means not only increasing the output of gas with the consequent possible reduction in price, but greater satisfaction to the con- sumer, better conditions for the work-people, less smoke, and general improvement in the health and surroundings of the whole community.

I will next show a few pictures of various types of furnaces We then come to the question of efficiencies of different types, and a slide shows graphically the thermal efficiency. The lowest is the ordinary type; second, good ordinary—*i.e.*, well designed with good insulation; third, surface combustion. Be-

tween these should be a line for the converted furnace; for a good ordinary furnace with the usual two-valve control can be fitted with the surface combustion system with great advantage, and will give far better results than the usual type, though not quite so good as one specially designed for the system.

As an example from actual tests, a "Hoe" 6000 lb. type metal pot was converted. On the old system the gas consumption was 7000 to 8000 c.ft. per 24 hours; after conversion this was reduced to 4920 c.ft. per 24 hours—a saving of 33 p.ct. (1500 lbs. per hour). An "Autoplate Junior" was also converted, with the result that 8¾ tons of type metal were melted in 4½ hours by 4398 c.ft. of gas, against 7 tons in 5 hours with 4085 c.ft.—*i.e.*, 1 ton in 30 min. with 532 c.ft., against 1 ton in 43 min. by 712 c.ft. with the old system. This was a saving of 13 min. in time and 25 p.ct. in gas consumption.

A small rod-end furnace, fitted with this system in place of the standard two-valve control, was heated from cold to 1000° C. in 8 min. with 87 c.ft. of gas, as against 10 min. with 100 c.ft.—a saving of 2 min. and 13 p.ct. gas consumption. To hold the furnace at 1000° C. on the old system took 284 c.ft. per hour, and on the new system 198 c.ft. per hour—a saving of 30 p.ct.

[The report of the discussion to which the paper gave rise is held over until next week.]

Gas in the Brush Industry.

The brush industry of the United States has, we learn from the "American Gas Journal," enlisted the aid of gas as a fuel, which is playing an increasingly important part in the brush factories of the country. It appears that horsehair, for bristles, reaches the factories in large canvas bags. This must be carefully sterilized, and to that end huge vats of disinfectant are heated almost to the boiling point; and in these the hair—sacks and all—is immersed. Gas burners keep the liquid at a constant temperature, whereas with the coal formerly used many sacks of hair were destroyed by the unexpected boiling of the disinfectant. When the bristles have been cleaned and sorted, they are dipped in pitch to hold them in the wooden brush-backs. Until recently, the pitch was heated with charcoal, and frequently fires of the inflammable material resulted. Gas burners have entirely done away with this risk. The final stage in the manufacture of many brushes is japanning; and in this work gas has brought about notable improvements. The painted brush-backs were formerly baked in a coal-heated oven, with the result that dust was deposited on many of the wet brush-backs, ruining the high finish. The problem of dust has been eliminated by the use of gas; while the time required to dry brushes has been reduced from twelve hours to an hour-and-a-half in a gas-fired cabinet.

Heating by Gas in Los Angeles.

The gas heating of "height-limit" office buildings in the City of Los Angeles is the culmination of fifteen years of constant effort by the Los Angeles Gas and Electric Corporation. This statement is made by the Corporation's Industrial Engineer (Mr. C. M. Robert) in an article published by the "Gas Age-Record," in which he claims that high office buildings are adapted to the use of gaseous fuel for central heating. Fifteen years ago there were probably not more than a dozen gas furnaces on the Corporation's entire system, and these were house-heating installations. This mere handful was, however, the forerunner of a campaign which has resulted in a city that to-day uses gas to the practical exclusion of all other fuels for the heating of its homes. At the beginning of 1910, there were 66,175 meters on the system; and the average consumption of gas per meter for the preceding year was 22,505,438 B.Th.U. On Jan. 1 of this year the total number of meters had risen to 306,318, with an average annual consumption per meter for the preceding year of 44,135,047 B.Th.U. The rapid increase in population furnished a very fertile field for gas house-heating activity. The burner now used is of the Corporation's own invention. It is installed on the outside of the fire-door, and the gas is drawn through a cylinder with the stack velocity; the air for combustion being regulated by a slide.

An American Refractories Institute.—The announcement is made by "Industrial and Engineering Chemistry" of plans for the formation of a bureau to be called the American Refractories Institute, for the purpose of providing a satisfactory means of contact between representatives of all industries using or manufacturing refractories and for the study of the various economic and technical problems arising with respect to heat-resisting materials. A research laboratory will be operated in connection with this Institute. The Organizing Committee are inviting the special attention of users of refractories to the Institute, in accordance with the fundamental idea of making it a service bureau for the consumer as well as for the producer of refractories. Mr. Macdonald C. Booze, Senior Incumbent of the Multiple Industrial Fellowship on Refractories at the Mellon Institute, Pittsburg, has been appointed Secretary of the Organizing Committee.

MIDLAND JUNIOR GAS ASSOCIATION.

The Annual Meeting of the Association was held on Thursday, April 23, at the Birmingham Council House—Mr. Harry Clark, the retiring President, in the chair.

The annual report was approved on the motion of Mr. J. H. Gee, who took the opportunity of pointing to the responsibility of individual members.

The resolution was seconded by Mr. W. E. Cadwallader (Birmingham).

Mr. A. R. Myhill (Hon. Treasurer) presented the statement of accounts.

Mr. J. H. Gee (Central Laboratory, Nechells), the Senior Vice-President, becomes President, and Mr. C. F. Tooby, Folkes Hill Works, the Senior Vice-President.

Messrs. C. F. Deekin (Cradley) and G. E. Currier (Smethwick) were appointed members of the Council.

Mr. H. R. Hems was unanimously re-elected Hon. Secretary, and on behalf of the members the President paid tribute to the efficient way in which Mr. Hems carried out his duties.

Mr. Myhill stated that he was unable to continue as Hon. Treasurer; and Mr. George W. Smith (Nechells) was unanimously appointed to that position.

The meeting confirmed the re-election of Mr. W. P. Timbrell as Hon. Auditor.

Mr. T. H. Poulson (Stafford) warmly congratulated the Association upon their virility and the excellent work they were doing.

A discussion was opened by the President, on the subject of

UNACCOUNTED-FOR GAS.

It is surprising how much this very important question, gas unaccounted-for, is continually kept in the background by the gas industry. The magnitude of the difference between the amount of gas made and gas sold each year is fully realized when we know that the average quantity of gas unaccounted for each year for 100 undertakings is 7 p.ct. If we take 30 of the largest undertakings that make over a thousand million cubic feet of gas per annum, we find the following startling figures: A total of 9,425,123,279 c.ft., or 47,125,616 therms. I wish to make it clear that these figures do not represent a distinct loss, for the simple reason that the difference in the conditions of measurement between gas made and gas sold, and the inevitable leakage from holders, mains, and services (the latter two are now materially affected by the tremendous increase in road transport), must be taken into consideration; and allowances should be made. Whether the subject is too large for the Junior Associations to tackle it is difficult to say, but we have the opportunity to-day of examining this tremendous difference apparent year after year. There are eight ways whereby we can account for the difference between gas made and gas sold; but I propose to deal with only one, which during my experience in four large centres, I have found to be one of the worst—that is, meters. I will give some practical reasons why meters are guilty. Careful tests have revealed the fact that a very large number of meters register from 3 to 15 p.ct. slow; and in the case of prepayment meters it is a common occurrence for consumers to refrain from inserting another coin because they can obtain sufficient light for a period before the valve shuts-off the gas properly. This has been most marked since we have had war and post-war gas. A fair basis shows that out of 1000 meters, 250 register, on an average, 15 p.ct. slow—an alarming figure, but true. I will now deal briefly with the question of the cost of inspection, changing, and repairing prepayment meters, the gas through which forms the backbone of our consumption. Experience has proved that the most effective and economical way of tackling these meters is for the defect to be found by test meter inspectors on the district—not by ordinary meter inspectors. The former examine thoroughly 25 to 30 meters per day; and we are sure that only faulty meters will be changed and repaired. The total present-day cost is £1 5s. 6d. per 3 or 5 light meter. Many will disagree with this expenditure; but to those I say: We have no guarantee that the meters will remain at 15 p.c. slow, and the chances are that the loss will soon increase, whereas, when the meter is changed, you have the guarantee and satisfaction that all is well for some time to come. In the remarkable paper given by Mr. A. T. Gilbert, in November 1922, on "Gas Meters, Their Construction and Application" (see "Journal" for Dec. 6, 1922, p. 622), the author states that there were 78 meters exchanged, and the total gain in gas was 844,000 c.ft.—an average gain per meter of 10,800 c.ft. Assuming that the cost of finding each meter was 2000 c.ft., then the net gain per meter was 8800 c.ft. Far too much importance has been attached to the checking of the consumption figures by the rental department, who could be easily misled by the "fairy tale;" besides, inquiries are a delicate matter. It is much better to send and test on the consumers' premises. For many years I have studied closely the question of unaccounted for gas and its relationship to the registration of all kinds of gas meters. I do not hesitate to recommend strongly the changing of all dry gas meters once in five to eight years, re

nembering that same are subject to much higher pressures and consumptions than was experienced years ago.

Mr. R. G. Marsh (Birmingham Gas Department), who was unable o be present, wrote as follows: One aspect of the manner in which ve arrive at the figure of unaccounted-for gas has always struck me as being rather irrational. I refer to the fact that corrections or temperature and pressure are applied to the registration of the station meters at the works, while no correction whatever is applied o the registration of the meters which re-register it on the district, where the variations in temperature and pressure are at least likely to be just as important in their effects on the actual volume of the gas. As a matter of interest, I have made a few observations during the past week of the temperature of gas as actually delivered to consumers' meters on the district; and the average I have obtained is 40° Fahr. The gas is corrected to 60° Fahr. when passing through the station meters. Allowing a variation in volume of 1 p.ct. for each 4° Fahr. difference in temperature, this means that there is 3½ p.ct. shrinkage in the volume of the gas after it has passed the station meters and before it reaches the consumers' meters. There is, of course, a correction to be applied which acts in the opposite direction in respect of barometric changes. Taking the average figure to be 29½ in. in Birmingham, this represents a difference of about 1½ p.ct. increase in volume, due to lessened atmospheric pressure. The net result is that there is an amount of approximately 2 p.ct. which appears in our unaccounted-for figure, and which really is accounted for by the causes I have mentioned. Apparently, therefore, instead of our figure being about 5 p.ct., it should really be about 3 p.ct. I have not taken gas temperatures during the midsummer quarters; but I should be surprised if any very great difference in temperature would be found from the figures I have before mentioned. Some years ago we made a similar investigation, and the temperatures we obtained then very closely agreed with the figure of 46° Fahr. that I have mentioned. An amount of 2 p.ct. on the total quantity of gas sent out by an undertaking such as ours represents a loss in revenue of a very serious nature; and possibly it may be found worth while, at some later date, for gas undertakings to fit consumers' meters with some type of automatic gear to correct the registration to normal temperature and pressure. There has already been some work done on this question; and I think it is a practical proposition. The objection to it is, of course, that such an appliance would add to the expense and complication of meter mechanism, and it is desirable to keep such apparatus as simple and reliable as possible. On the facts ascertained, however, it would seem that there is an important percentage which is recoverable, and which at present appears against the undertaking, and is put down as unaccounted-for.

Mr. J. Hewett (Birmingham) observed that apart from the question of the registration of the meters in relation to temperature and pressure, there were other factors to be taken into account. There were leakages from the gasholders and other apparatus, as well as in the mains and services; and in Birmingham the unaccounted-for gas worked out at about 80,000 c.ft. an hour. An attempt was made to arrive at the amount of loss in the mains prior to 1914. The work of inquiry took two years, and, in all, they dealt with fifty miles of mains. The Department then had 900 miles of mains. They selected the routes along which were the oldest mains, and closely-spaced indicators were used. The losses at individual leakages were not severe, though in the aggregate the amount lost was large. Another cause accounting for some loss was the blowing and tilting of the holders; while a good deal of gas was lost in the making of connections. In his opinion, however, it was cheaper for the Department to lose the volume that now escaped into the atmosphere than to use a special apparatus by which the gas could be locked in. As to the estimates of non-metered supplies, for public lighting, &c., he could not say whether or not they were near the mark. In his own opinion more gas was used through the lamps than was credited in the books. Another factor was the use of by-passes.

Mr. S. W. Simmons (Dudley) attached great importance to the correcting of temperature and pressure. He complained that the meter readers were too favourably disposed to the consumer. At Dudley they had substantially reduced the leakage. He was satisfied there was a tremendous amount of unaccounted-for gas in public lighting. A close supervision of the by-passes was essential.

Mr. W. L. S. Spinks (Birmingham) mentioned the reference by the President to unaccounted-for gas due to meters registering slow. He thought it was possible to exaggerate this. If a dry meter was defective in registration, and 15 p.ct. slow, the chances were that some of this might be due to a leaky diaphragm. There were many meters which would register correctly at the normal rate at which they were tested; but if gas was passed at the rate of 120 c.ft. an hour, the registration might be 8 p.ct. fast, due to the way in which the valves were set. Temperature differences were responsible for much loss.

Mr. T. H. Poulson (Stafford) thought all gas unaccounted-for rose during the war period. It was so at Stafford; but they were now getting back gradually to pre-war figures. It was a paying proposition to deal promptly with small leakages. As to the reading of meters, they adopted in Stafford a system by which a responsible man went through the meters twice a quarter; he examined the meter book, made current entries, and then compared them with the previous records. If there was any serious deficit, he looked for an explanation. By this means considerable reductions had been made in regard to leakage.

Mr. J. H. Gee (Nechells) accepted Mr. Marsh's figures as to temperature, and pointed out that in an excellent statistical summary on the subject, Dr. Davidson gave the atmospheric temperature as 48° Fahr. for the whole year. [See the "Journal" Diary and Gas Calendar for 1925, p. 150.] This gave an apparent loss of 3 p.ct. on a moist gas.

Mr. Hewett pointed out that the services were so close together that, in making connections, &c., it was practically impossible to interrupt supplies. The unaccounted-for gas in Birmingham averaged 4·6 p.ct. over 25 years; and the loss was, of course, greater in the winter, when the actual consumption was 70 to 80 p.ct. more than in the summer.

SCOTTISH JUNIOR GAS ASSOCIATION.

(WESTERN DISTRICT.)

The Annual General Meeting was held in the Ca'doro Restaurant, Glasgow, on Saturday, April 18—Mr. M'Isaac, President, in the Chair.

The Hon. Secretary submitted the Council's annual report, which recorded that there was an increase of 30 members during the session; the total membership now being 355.

The Council's recommendation was unanimously adopted to send a donation of five guineas to the Gas Exhibit at the British Empire Exhibition, 1925, and five guineas to the Education Scheme of the Institution of Gas Engineers.

For the best paper read during last session, the adjudicators awarded the first prize to Mr. D. M'Kerracher, B.Sc., for his paper on "Heat Transmission," and second prize to Mr. R. Sturroch, Ardrossan, for his paper "A Chemist on Works Practice."

After the donations had been accounted for, the session closed with approximately £50 in hand. The Council's report was unanimously adopted.

Mr. R. Gray, Assistant Manager, Hamilton, automatically becomes President for next session. Mr. James Hall, of Glasgow, was unanimously elected Vice-President. Mr. J. Murray was re-elected for the post of Secretary and Treasurer. The following members were elected to Council after a vote by ballot: Messrs. James Brown, Glasgow; John M'Intyre, Glasgow; John Teape, Glasgow; R. Fife, Kilmarnock; S. M'Gowan, Glasgow, and R. Keillor, Greenock.

A letter was read from Mr. James Lowe, of Auckland, New Zealand, congratulating the Association on having attained its majority, and wishing all prosperity. It will be remembered that Mr. Lowe was the first President of the Scottish Junior Gas Association.

The Chairman then called on Dr. Smith to address the meeting.

CURRENT TOPICS.

By Dr. E. W. Smith, F.I.C., M.I.Chem.E. (Technical Director of the Woodall-Duckham Companies).

On looking back over the last twenty years, one is impressed with the enormous strides that have been made in the "technicalization" of the gas industry. This is not yet complete. The technically-trained man is not yet sufficiently used, and when he is used he is not given sufficient responsibility. This is largely due to the fact that the right type of technical man, having broad views, good personality, and human interests is difficult to get. However, technical men are being employed more and more in connection with the production of gas. More technical men should be employed in connection with the utilization of gas, including its distribution.

I would like to say one word in connection with the duties of those who are responsible for the juniors in the industry. Every encouragement should be given to technical training. The man who is prepared to work in his own time, qualify himself in various ways for the job he holds, and for the jobs he hopes to hold, should be treated differently, from the point of view of salary and advancement, from the man who, while doing his bare duty, has no ambitions, and is little more than a time-server. There is no room in any progressive industry for many time-servers, and the stultifying influence on progressively-minded young men of the "seniority" basis of advancement will have to go.

In speaking of the necessity for technical or scientific training, it is often overlooked that scientific training is not confined to a knowledge of chemistry, physics, and the generally recognized sciences. There is definitely a science of industry, a science of commerce, and a science of business organization and of management. It is not sufficient to work from hand-to-mouth, and deal with the problems that arise, as they arise. An industry, if it is to be anything at all, and progress in the way it should, must have men at the head of its undertakings who plan for the future, who organize before the event, who shape the fate of their industry, rather than allow external influences to shape it and them. Our industry is exactly what we shall make it; and I am sure that, with proper foresight, true conceptions, and scientific business organization, it can hold that position which is second to none in our country—a position of directing the utilization of the whole fuel resources of the country.

At present, for various reasons, the British gas industry is further advanced than the gas industry of any other country; but while believing this, I know that in some details other countries have much they can teach us. I am always very much impressed by the organization of the American Gas Association. I have attended a number of their meetings, and know to a large extent the inner workings of their organization. One notes that it has been found possible for those engaged on the contracting side of the American gas industry to associate on an equality in that Institution with those engaged on the gas production side, to the considerable advantage of the industry as a whole. One also notes that the membership is based on individuals and individual qualifica-

tions rather than on the positions men hold. One is impressed by the volume of really valuable committee work that is done, the results of which are published by the Association. One notes that there is a committee of the American Gas Association for every distinctive activity of the American gas industry. These committees are alive, productive, and inspiring to the whole industry. They are vitalized by a selection of individual membership of each committee which is appropriate and conducive to activity and the production of valuable reports. Like all committees, they depend for their success on the energy and capacity of their chairmen and secretaries. To a very large extent these posts are held by highly-experienced, technically-trained young men. The chairmanship of any particular committee cannot be held for more than one year; and there is great competition to make each succeeding year better and more productive than the last.

At the annual meetings each section has its own session, and the reports of the committees have to bear the criticisms of the annual meeting. A little more of the American spirit and point of view would not harm the British gas industry, as I am confident that under such a system the results would be at least as good as those acknowledged to have been attained in the American Gas Association

The progressive industrialist is a convinced believer in the advantages of gas over solid fuel or oil, and the greatest deterrent to its much extended use is the cost per therm for industrial purposes. In this connection I believe that the whole question of the methods of charging for gas for different purposes is worthy of reconsideration; and I would like to see a committee of the National Gas Council, consisting of experienced business men, working in co-operation with first-class accountants, devising a scheme which should have for its objective the encouragement of the maximum possible sales of gas in all areas. At present there is not sufficient differentiation between the price charged for gas used in small quantities for lighting, and the price charged for larger quantities, such as domestic heating, motive power, and industrial furnaces. In many districts, restaurants, which are commercial and industrial enterprises, and which use annually a great deal more gas than many of the recognized industrial concerns, are paying for gas at the domestic rate. In many areas gas used in fried fish shops is being charged for at the domestic rate. The man who heats the whole of his house by means of gas alone or gas and coke, using up to 20,000 c.ft. per quarter in the winter months, pays the same price for his gas in all areas as the man who uses gas for lighting alone, amounting to perhaps 3000 or 4000 c.ft. per quarter. This does not appear to me to be commercially sound. It is altogether too much of a tax on the general consumer. The larger user, with his comparatively low installation and maintenance cost to the gas company, is paying for the relatively high installation and maintenance cost of the small consumer. This is very well recognized in the electrical industry. The over-all cost of production of electricity depends on very similar factors to the over-all production cost of gas.

It is not to be expected that among our small and moderate sized gas undertakings there will be facilities for getting at the bearing of all factors on one another in connection with the cost of production and sale of gas; but in the larger companies, and in the National Gas Council, which represents the whole, it should be possible for a thorough study to be undertaken of the whole subject, and a report made on the effect of various factors on the selling price of gas, and recommendations prepared as to the possible methods of differentiating between the charges that are justified against various classes of consumers. As an example of the type of thing I mean, it is worth while considering why it is that some foreign countries are able to dump into England goods at a price which is so much lower than that at which the same goods could be produced in England; the difference not being accountable for by the lower wages paid. One European country may be producing a particular type of article which requires plant and machinery of an expensive type. If this plant and machinery were to be used for 8 hours a day, the cost of production would compare with the cost of production in England, and would be economic in its own country. By working that plant and machinery, the interest on which is a big proportion of the total cost of production, for 24 hours a day, the cost of production of the articles made in the extra 16 hours is reduced to a very low figure; and this is approximately the figure at which they can afford to dump these articles in foreign countries.

Some time ago, a large industrial firm desired to utilize gas to the extent of over 20,000,000 c.ft. a year in its process. They could afford to pay 7d. a therm for the gas. The local gas company in looking through its accounts found that, by selling at 9½d. a therm, they made about ½d. a therm profit; and they came to the conclusion that 9d. a therm was the absolute minimum at which they could afford to sell the gas. During the conference, the question was asked "How much plant have you that is standing idle all the year round, or during any one week?" It was found that there was 25 p.ct. of plant standing idle, on which interest on capital was being paid. The question was also asked "How much is your gas costing you per therm into the holder?" The reply was "2½d." It was then pointed out that, as establishment charges, salaries, the distribution system, and interest and depreciation on unused plant were all having to be borne by the gas that was being sold, and not by the gas they were capable of making, it was possible that it would pay as well to sell the 20,000,000 c.ft. of gas per annum at 3d. per therm, as to sell their then output at 9d. per therm. This threw a new light on the whole subject, and from then on the prospective consumer had no difficulty in getting his 20,000,000 c.ft. guaranteed consumption at 7d. per therm.

Our electrical friends have appreciated the importance of differentiation of rates for some time, and many of the schemes which have been adopted are worthy of very close study on the part of the gas industry. It is well known that some electrical concerns are in effect being subsidized by gas undertakings. It is also well known that some electrical undertakings are subsidized from the local rates. At the same time there are successful electrical undertakings which have adopted systems of charging for electricity such as the Norwich rate and modifications thereof, which to my mind are sound in principle and excellent in results. One electrical concern in a large city in the North of England is successfully competing with gas for practically all purposes, on a cost basis, because of some such scientific system. I am sure that much more could be done than is being done in this particular direction by our own industry. It may or may not require legislation, but the first requirement is for us to study the subject in all its ramifications, and thoroughly understand it, in order that the best schemes may be adopted.

The cost of industrial gas to the consumer is not the only factor that influences him in making his decision as to whether or not to use town gas in his processes. A great deal still needs to be done in connection with the efficiencies obtainable in industrial furnaces, and there is little need to remind you that, if the amount of gas used in a given process can be reduced to half, the consumer is as satisfied as if the price had been reduced to half. In many cases such a reduction is not possible, but there are a large number of furnaces working in industry at the present time which are giving efficiencies in heating, quite apart from particular methods of working the process, which are from 20 to 60 p.ct. better than the general run of furnaces.

The furnace business cannot be run on similar lines to the gas cooker or fire business. The large bulk of the latter is done through the gas companies, everything is standardized and except for minor adjustments for varying quality of gas and pressure, a gas fire and a cooker which give satisfaction in one locality may give equal satisfaction in another. Consequently mass production is possible with such apparatus, and little technical supervision is necessary, either in the specification for room heating or cooking, or in the actual fixing of the appliances. This does not hold in furnace work. Practically every furnace has to be specially constructed for the job it has to do, and every furnace should be started up in the first instance by a highly-specialized furnace expert.

There is excellent furnace equipment on the market made by one or two experienced firms. There is also a great deal of rubbish, just as there is on the lighting burner and fitting side. The gas companies and consumers look too much to the question of first cost, and too little to the question of upkeep and of obtaining all necessary results and conditions of operation.

I do not intend in this paper to go again into the question of what constitutes first-class furnace design and operation. I would, however, like to indicate to you some directions in which industrial gas is extending in its use. Four years ago comparatively little gas was used in the printing trade in England. At present British Furnaces, Ltd., alone have over 100 installations in the London printing trade. The new principle of heating, known as surface combustion, but without the employment of the diaphragm, has been successfully applied to junior and senior autotype machines, to Hoe furnaces to Winkler machines, and to the backing-up furnaces usually employed in the printing trade. In most cases this equipment has displaced coal and coke, with all the consequent advantages of increased output, increase in speed of heating, better conditions in the workshop, freedom from presence of solid fuel, its storage, and any necessity for disposal of ashes. No fewer than 75 printing shops are using this equipment in London. In some cases it has displaced already existing gas apparatus, and the results have been so remarkable that, when they became known, other printing establishments rapidly converted their furnaces from coal, coke, or oil, to gas.

The autotype machines vary in size. They may contain from 13 tons of metal down to 7½ tons. The rapidity of heating with the equipment in question will be appreciated from the fact that 7½ tons of stereo metal are brought from cold to a liquid state, at a temperature of 600° Fahr., in under 1½ hours; and during the period when plates are being cast, the casting and melting takes place at the rate of 420 lbs. of metal per minute. During the ordinary working week these baths of metal are kept liquid during the day, while the furnaces are not in operation, and the gas used for maintaining fluidity and for melting the metal during process work corresponds to 1 c.ft. (500 B.Th.U. gross) for every 10 lbs. of metal melted. During the working period, and excluding the gas used during

ne stand-by period, the quantity of metal melted per c.ft. is s high as 26 lbs. By substituting this equipment throughout neir furnaces, one large printing organization state that they re saving over £2000 a year on gas consumption alone, equal) 24,000 c.ft. of gas per week on each of 9 furnaces. But nis is not the only saving. It was common in the printing rade for the cast-iron pots to fracture, due to irregular and ocal heating. These pots are valued at between £50 and £60 ach, and one firm alone, over a lengthy period, lost one pot er fortnight, which was shown in their books as being a net oss of £1248 per year. British Furnaces have had their quipment in use now for over three years, and there has not een a single instance of a fractured pot. In order to gain onfidence, it is necessary that the furnace builder shall be repared to give guarantees. If he does not fulfil them, he hould remove his equipment, and the consumer should be elieved of the cost thereof.

It would be a good thing if industrial concerns in the gas ndustry were to give a lead in connection with the utilization f town gas for industrial purposes. I am glad to state that Messrs. Thomas Glover, of Edmonton, have converted all their urnaces to gaseous firing, including crucible tinning and dross urnaces. The provincial newspapers are rapidly following he lead of the London newspapers, and many of them are now n gaseous firing. There is no doubt, particularly on high output work, such as that in the printing trade, gas is by far he best fuel. Another point of interest is that in no single nstance in the printing trade in London has there been any lismantling of gas equipment due to defect in the last three ears; so that the equipment is not only efficient, but it is fool-roof and practical.

Another direction in which gas is being applied with advan-age is in connection with steam raising for hotels and indus-rial concerns where cleanliness and space occupied are of mportance. Without feed water heaters, efficiencies can be guaranteed, for load conditions varying from 50 to 100 p.ct. of the capacity of the boiler, of between 85 and 90 p.ct. The water-level in the boiler can be maintained automatically, and the gas consumption regulated by the pressure of the steam in the boiler. A full description of such equipment was given by Mr. James W. Reber before the Midland Junior Gas Associa-tion on Feb. 27 (see "Journal" for March 4, p. 529).

The Woodall-Duckham Cochran boiler, which has been modified for gaseous firing, has a special advantage over other gas-fired boilers in that it has a definite combustion chamber, and a refractory radiating bed giving all the advantages of a highly-incandescent coke fire. It is possible in a few hours to convert the boiler from gas to coke, or the reverse—a con-venience which is readily appreciated by the consumer.

Another matter on which I should like to touch, which does not come directly under the purview of a junior gas association, but which is of great importance to the gas industry, and about which juniors should be fully informed, if they are to take senior positions, is one which has recently been raised by the tar distillers of Scotland through a paragraph which ap-peared as an advertisement in the "Evening Times" on Friday, March 6. In this paragraph the tar distillers proved to their own satisfaction that it is much more profitable for gas undertakings to sell crude tar to the distiller than to attempt to supply the requirements of the local surveyors for road tar. The paragraph is a piece of the best special pleading that I have read for some time; but no one should complain about it. It is perhaps worth while, however, putting forward another point of view. Mr. Napier, of Alloa, has stated that gas undertakings can make in some cases 40 p.ct. more profit out of their tar by distilling it themselves for road purposes, than if they sell it as crude tar to the tar distiller; and Mr. Napier has backed up his opinion by installing a plant in which to prepare his road tar.

There is no doubt that many road surveyors have found difficulty in using the reputedly prepared tar with which they have been supplied. The fault itself does not lie wholly at the door of gas undertakings. Much crude tar has been sold by the latter to road surveyors through intermediate channels, and it has reached the surveyors after little or no treatment, and the gas undertakings have received most of the blame. It goes without saying that dehydrated tar, pure and simple, is not suitable for road purposes in most cases, and many dehydrating plants are not capable of producing road tar. It is also incon-trovertible that many undertakings have dehydrating plants which are capable of making, and do make, road tar equal to the best that is being produced by any tar distiller. I am speaking with full knowledge and experience of this particular matter. In by far the majority of such cases the profits ob-tained for the tar produced by the gas undertaking are far in excess of the figure that the distiller can afford to pay for the crude tar. It is obvious that this must be so. The cost of conveyance of crude tar to the distillers' works, and of the pre-pared tar from the distillers' works to the road surveyor, in practically all cases, is considerably greater than the cost of carriage of prepared tar from the works of the gas undertaking to the local surveyor; and the crude oils obtained during dis-tillation are still available for sale to the distiller. The road tar market is a seasonal trade, and the multiplicity of gas undertakings have in total not only better storage facilities than the small number of distillers, but these facilities are geographically very much better dispersed and placed for the convenience of the road surveyor.

The advertisement in question stated that "Dehydration, by the very nature of the process, is incapable of producing a properly distilled tar of uniform quality suitable for roads." This is perfectly correct, but no gas engineer sells dehydrated tar as such, if he is asked to supply tar which shall conform to the Road Board Specification; and he is just as capable as the tar distiller of producing, where suitable plant has been installed, tar of a satisfactory and uniform quality, particu-larly in view of the fact that he is dealing solely with his own crude tar, and not with varying qualities and quantities of different tars from different works.

As regards the production of special road preparations such as bitumen mixtures and "filled" tars, these have been made for some time by the Glasgow Corporation Gas Department, and bring at least as high a price as reputedly similar prepara-tions made by the Scotch tar distillers. Many of the smaller undertakings—such as Dunfermline, Alloa, and Dundee—are following the lead given by the Glasgow Corporation.

The advertisement in question pleads that the "bulk of the crude tar produced is at present sold by gas undertakings on a sliding-scale, rising and falling with the values of pitch, oil, and naphtha month by month, and these values must always be the basis governing the price of tar." This is not quite correct, because values of pitch, oil, and naphtha have not necessarily any relationship to the value of prepared tar for road purposes; and the prices obtained for prepared tar have, in the past, been such as to show a considerable margin over those received from the tar distiller for crude tar. This can be readily realized when it is appreciated that the cost of con-version of crude tar to prepared tar for road purposes, and to meet the Road Board Specification, unless the crude tar is very high in water, is practically covered by the value of crude benzole, &c., obtained during this treatment. If gas under-takings thoroughly study the requirements of the Road Board, they are capable of enhancing the value of their tar, and are also in the happy position of being able to vary slightly, at the request of the road surveyor, the quality of their product.

There has been a great outcry during recent years concern-ing the necessity for smoke abatement. With this outcry the whole gas industry is in agreement. The one contribution that the industry has made up to date—and it is a very big one—is to advocate the use of gas wherever possible; but it must be remembered that in the production of town gas it is necessary to produce coke, and coke is the greatest asset that gas undertakings have. It is nevertheless looked on as being a worry and a nuisance in many cases. In the past coke has either been shipped abroad or used largely in industrial pro-cesses.

The smoke nuisance is largely caused by the 38,000,000 to 40,000,000 tons of coal which are used throughout Great Britain in the domestic fire; and until this tonnage is materially reduced, there is no hope of abating the smoke nuisance. Now, the gas industry has for sale approximately 8,000,000 tons of coke annually. There are periods in the year when many concerns accumulate large stocks of coke. There are other periods when stocks are depleted. The prices ob-tained vary almost universally with the stocks held. The sale of coke is also widely influenced by the condition of trade.

You will agree with me when I state that, if coke could be used in place of coal in the domestic grate, not only should we obtain a comparatively smokeless fire, but the demand for coke would vary with the demand for gas, and therefore corre-spond with its production. There will also continue to be a demand for coke for industry; and assuming that in the very near future 10 p.ct. of those using coal in the domestic grate were to be converted to the use of coke, the whole of the available gas-works coke would be absorbed at an average price greater than that obtained at the present time. What is to prevent such a state of things coming to pass?

The principal objections to the use of coke as a substitute for coal are:

1. Its high moisture content.
2. Its poor grading and screening.

From a large amount of experimental work I have person-ally carried out, I am confident that, if coke of a regular and uniform size of $\frac{3}{4}$ in. up to $1\frac{1}{4}$ in., large coke being broken when necessary, and with a moisture content no higher than 5 p.ct., were put on the market, acceptable fires would be obtained in by far the majority of standard grates. The gas industry would then not only supply gas for most purposes, but would also supply coke, and would have gone a long way towards the ideal of its becoming the sole providers of domestic and industrial fuel.

Discussion.

Mr. James Graham (Kilmarnock), thanking Dr. Smith for his address, commented on the fact that gas engineers' activities were hampered by the various committees which at times were not as interested as they might be in the general welfare of the industry. He suggested that the hire-purchase system might be advantageously used to induce consumers to fit industrial appliances.

Mr. R. Gray (Hamilton) asked Dr. Smith if he could say that a large-unit gas-fired boiler capable of heating a hall for about 2000

people was economical, and if the present quality of dehydrated tar sent out from gas-works could compare with others on the market for road purposes.

Mr. Simpson (Greenock) asked Dr. Smith if he had found coke suitable for domestic fireplaces.

Dr. Smith, with regard to Mr. Gray's question about the boiler system, said that, if the cost were taken on purely a fuel basis, then it was not economical to instal a gas-fired boiler, but attention must be given to labour values, available space, &c.; and when these were all taken into account, there was no doubt about it that gas was the cheaper way of heating large places. With regard to coke for domestic fires, Dr. Smith instanced the recent exhibition at Manchester, where a coke fire was used continuously for 14 days, and the cost worked out at about ½d. per hour.

On the motion of Mr. M'Isaac, a hearty vote of thanks was accorded to Dr. Smith for his address.

YORKSHIRE JUNIOR GAS ASSOCIATION.

A meeting of the Association was held on Saturday, April 18, over sixty members (under the presidency of Mr. E. Gillett, Bradford) assembling at the engineering works of Messrs. J. Blakeborough & Sons, Ltd., of Brighouse. Among the visitors was Mr. W. B. M'Lusky, the Engineer and Manager of the Halifax Gas Department, who is the representative of the Manchester District Institution of Gas Engineers on the Council of the Yorkshire Junior Association.

On behalf of the Directors of the firm, Mr. C. J. Vickers welcomed the visitors, who then made a tour of the works under the direction of Mr. Vickers and Messrs. H. Tart, H. Stott, and A. Hopkinson.

Messrs. J. Blakeborough & Sons, Ltd.

In 1886 the firm was launched under the title of J. Blakeborough & Sons. Situated in the centre of Brighouse, the premises were known as the Commercial Iron and Brass Works up till 1890, when Messrs. Blakeborough finally vacated them. As the business grew, the old site became crowded up, and in 1875 it was decided that new premises must be built where expansion would be unrestricted. Land beside the main line of what is now the London, Midland, and Scottish Railway Company, at Woodhouse, was purchased, and an iron foundry was erected and equipped. In 1892, mechanics' shops and pattern-making shops were built alongside the iron foundry, and since then extensions have been practically continuous up till a recent date. During the war large additions to the premises were made to meet the demands of the British Admiralty; the adjoining site formerly occupied by the Rastrick Gas Company's works being incorporated, together with the intervening street. Later, the firm became associated with Messrs. George Kent, Ltd.

Woodhouse Works.

Started as an iron foundry to relieve the pressure on the Commercial Iron and Brass Works, Woodhouse Works now occupy an area of about 13 acres. The site was well chosen; it adjoins, on one side, the main line of the London, Midland and Scottish Railway Company, and on the other the canal that runs from the Humber to the Mersey, connecting Hull and Manchester. A siding from the railway penetrates to the heart of the works, affording facilities for the transport of raw materials and finished products, and forming, in fact, a private railway system operated by the firm's own steam locomotive.

In addition, a tramway system is laid throughout the whole works, serving for the transport from department to department of parts in course of manufacture. Woodhouse Works is a compactly organized establishment. Offices, power-house, pattern-making department and stores, foundries, machine shops, brass department—comprising foundry and machine shops—testing department, laboratory, erecting and dispatch departments, are all grouped in due order, constituting a complete unity.

After the inspection, the visitors were entertained to tea in the workmen's large canteen.

Mr. Gillett said he was surprised at the magnitude of the firm. The shops, and the well-organized system of production, were certainly worth seeing; and he felt sure that every member had benefited considerably by the visit.

Mr. J. B. Balmforth (Bingley), proposing a vote of thanks to the firm, said that Messrs. Blakeborough's was a name well known throughout the whole engineering profession.

Mr. T. Clarke (Brighouse) seconded the proposition, and paid a fine tribute to Messrs. Blakeborough's for the quick and efficient service they rendered to gas-works generally. Regarding the merits of their valves, he had always found them to be effective and reliable.

Mr. Vickers, responding on behalf of the firm, said that if the members had enjoyed the visit, the firm were amply repaid.

Midland Association of Gas Engineers and Managers.—The spring general meeting of the Association will be held at Oxford, on the invitation of the President, Mr. W. E. Caton, and the Chairman and Directors of the Oxford Gaslight and Coke Company, on Thursday, May 7.

PROGRESS OF APPLIED CHEMISTRY.*

A Few Extracts.

The Annual Reports of the Progress of Applied Chemistry, issued by the Society of Chemical Industry, are authoritative reviews packed with useful information on which complete reliance can be placed. In Vol. IX., which has just been issued, the section on Fuel is contributed by Prof. J. W. Cobb and Mr. H. J. Hodsman, of the University of Leeds, and that on Gas, Destructive Distillation, and Tar Products by Dr. W. B. Davidson. Each constitutes a concise account, together with critical comment, of all the more important developments which took place in 1924 in these particular branches; and all who wish to be well informed on these matters will find the reviews of the utmost value.

Power Production.

It is, of course, neither desirable nor necessary to recapitulate what is set down in these two sections; but attention may be drawn to one or two points. It is only a matter of a few weeks since a descriptive article of the Brunler submerged-flame boiler appeared in the columns of the "Journal" (March 11, p. 508). Such a method of power production, state the authors of the section on Fuel, would demand a fuel freed from sulphur to a superlative degree; and even then it could not be assumed that trouble from the acid oxidation products of nitrogen and from hydrogen peroxide would be non-existent. In dealing with power production, they mention the mercury-vapour turbine due to W. J. Kearton. This works between temperatures in a range above the boiling-point of mercury; the vapour expanding into a condenser functioning as a steam boiler, the steam output of which drives a turbine of the normal type. "While novel and revolutionary methods of improving the efficiency of methods of utilizing fuel by means of steam engines naturally excite great interest," state the authors, "it remains true that the economy most easily effected is the operation of ordinary plant to the best advantage. It is notorious that, if the general standard of steam production were merely brought up to what is good boiler-house practice, great savings in fuel would result."

Carbonization.

The heat change which accompanies the carbonization of coal has been the subject of a number of researches both on the laboratory and the industrial scale. Some years ago H. Hollings and J. W. Cobb, by applying a differential method, divided the carbonization process into stages in which heat change was either exothermic or endothermic. In this research a quantitative estimate of the heat involved in the different stages was not attempted, but it was concluded that the total heat of the reactions was small. The subject has been recently examined again with considerable refinement at the U.S.A. Bureau of Mines Station, Pittsburg, by J. O. Davis and P. B. Place, who measured the heat change at different temperatures calorimetrically. The results showed that the reaction heat was in any case small compared with the total heat effects in the process, and in practice negligible. At low and high temperatures of carbonization the process was endothermic; at intermediate temperatures (500° C.) exothermic.

On the subject of low-temperature carbonization, mention is made of the extensive examination, made by K. B. Edwards, of a blast-furnace tar, Coalite tar, and tar from a Maclaurin plant and from continuous vertical retorts. All were found to be essentially of the same character, yielding, except for the higher phenols of the fuel-oil fraction, products of a low value. Phenol itself and other products of known technical value were absent.

Very interesting are the remarks on coke and its combustibility. The character of coke, it is stated, is open to considerable modification depending on conditions of carbonization. Formerly it was thought that temperature, and in consequence volatile matter, was the governing factor; but recent experience shows that a suitable texture is essential, whether produced by grinding, blending, the incorporation of catalysts, or more obvious methods such as the choice of coal, and thermal treatment. There is insufficient information available at present, both as to the full effect of the numerous factors involved in the carbonization process and on the financial balance-sheet, to permit an opinion as to the comparative value of the different treatments suggested. They offer most promising avenues for technical advancement in the carbonization process.

Speaking of waste heat, the authors state that the application of waste-heat boilers to horizontal retort settings has not been developed to any great extent, though there is here a vast quantity of potential heat available for raising steam, or other purposes. The divorce of the industries of carbonization and electrical power generation is unfortunate, for it impedes developments of this kind which might be mutually advantageous.

Inerts.

Dealing with this question, Dr. Davidson refers to the work of W. Bertelsmann on the influence of inerts in the practical

* Reports of the Progress of Applied Chemistry, issued by the Society of Chemical Industry. Vol. IX.—1924. Edited by T. F. Burton. Price 7s. 6d. to members of the Society, 12s. 6d. to non-members, post-free.

s of gas, which, he says, is calculated to alter the general nion of technical men in Germany, and confirm that of many this country who of late years arrived at the conclusion that objections to the inclusion of inerts in town gas have not en well justified. Bertelsmann compared straight coal gas h mixed gases. Illumination tests proved that thermal ciency was distinctly greater with poor than with rich gases. nen the illumination of an upright incandescent burner was usted to give its maximum candle-power, it was found that s containing about 20 p.ct. of inerts had the same efficiency a hydrogen mixture with practically no nitrogen in it. In ts of the heating of water from 20° to 70° C., efficiencies reased with a decrease in calorific value. In another series tests where calorific value was kept constant and the volume inerts made to vary, it was found that with gases diluted with drogen 96 calories were required to raise 1 kg. of water rough 75° C., whereas gases containing about 21 p.ct. of rts required about 98 calories.

Dr. Davidson considers at some length the three Cantor Lec- res of Mr. E. V. Evans on "A Study of the Destructive stillation of Coal" [see "Journal," Vol. 165, pp. 483, 550, 9]; and his remarks on this take the form of a résumé of e articles which were published in the "Journal" [see Vol. 7, pp. 447, 515, 580.]

Speed of Carbonization.

Speaking of the various patents taken out during the year improve the rate of carbonization and to obtain graded dis- lation in zones, Dr. Davidson mentions the method suggested Green and Laucks, which involves the use of a vertical re- t in which the coal is passed upwards by means of a hollow rew. Simultaneously with the heating of the coal by con- ction through the retort walls, heat is applied to the interior the screw by means of an adjustable burner. The pitch of e screw gradually increases from the lower to the upper end the retort; and the bore of the retort gradually increases from ttom to top, the diameter of the screw varying correspond- gly. Attention is also drawn to T. M. Davidson's proposal have the surfaces of the retort movable, to increase through- t. A vertical or inclined retort has longitudinal sections which e capable of reciprocatory movement, and the products of dis- lation may be taken off by a central tube, which may be raised lowered to any carbonizing zone. The whole retort is divided to lengths of uniformly increasing temperature, and the gases distillation pass in the direction of movement of the coal, nd are withdrawn at or below the highest temperature zone.

Oil Shale For Gas Production.

Many facts and figures with regard to the present position the oil shale industry in Esthonia are contained in a paper ubmitted by Mr. P. N. Kogerman, M.Sc. (Lond.), to the Insti- tion of Petroleum Technologists. Though the Esthonian oil ale, known as "Kukersite," was discovered more than a ntury ago, it was only during the late war that its importance ; a substitute for coal and as a source of gas and oil produc- on came into prominence. At that time, after trials of the aterial on a large scale had been carried out at the Petrograd as-Works, it was decided to embark on an extensive mining heme, which events precluded from being taken actually in nd by the Government until May, 1919. Since then the ex- oitation of the oil shale has continued without interruption; nd the annual output has now reached a very considerable gure. The probable resources are calculated at about 5000 illion tons. The consumption of "Kukersite" as a fuel for l kinds of boilers has been steadily growing; while the gas- orks at Tartu (Dorpat) and Tallinn have partially adopted it or gas production—though for the latter purpose coal is pre- rred because it produces coke and avoids the cost of ash re- oval. The author gives the following as the chemical com- osition of oil-shale gas:

	P.Ct.
Hydrogen	37·6
Methane	25·8
Heavy hydrocarbons	1·6
Carbon monoxide	19·1
Carbon dioxide	13·3
Nitrogen	2·6

n the gas-works named, the material is dealt with in old-type orizontal retorts, which are not altogether suitable for the arbonization of shale. The yield of gas is 10,000 c.ft. per ton; nd of tar, from 4 to 5 p.ct. Several plants for the distillation f shale oil are at work in Esthonia—including an installation f "Fusion" retorts, some figures with regard to which ap- eared on p. 149 of the "Journal" for Jan. 21 last, in con- ection with a paper read by Mr. T. W. Stainer Hutchins at joint meeting of the London Section of the Society of hemical Industry and the Chemical Engineering Group.

North of England Gas Managers' Association.—The annual eneral meeting of the Association will be held on Friday, May 1, at the County Hotel, Newcastle-on-Tyne. Mr. S. Shad- olt, President, will take the chair, and two papers will be read —one by Mr. C. Dru Drury, of Sunderland, on "Some Ex- eriences with Gasholder Tanks in a Mining Area;" the other y Mr. W. M. Galleway, of Whitby, on "Income-Tax Allow- nce for Wear and Tear of Gas-Works Plant."

THE NATION'S FOOD EXHIBITION.

The remark is often heard that life would be simpler and better if a day's supply of food, in the form of compressed tablets of vitamines, proteins, &c., &c., could be carried in the pocket. This plan might have advantages; but when one reflects on the delightful hours spent in human contact at tea or at dinner—the subject of breakfasts need not be dwelt upon here—the idea of tabloid-swallowing loses any attraction it may seem to possess. The mellow sayings of the old philosophers, the brilliant epigrams of the wits of the day, even the broad but kindly jests of the man of the soil—where would they all be, but for the humanizing and stimulating effects of good food and good drink? And in times of stress such as the present, it is good to think that the work of preparing meals has, thanks to the aid of gas, been so lessened that it no longer entails the nervous prostration of the housewife. Realization of this is strengthened by a visit to the Nation's Food Exhibition at Olympia. During the course of a year, Olympia undergoes many transformations. It changes, with the rapidity of a chameleon, from a hall where the latest developments of engineering can be seen to a place where the ideal home can be visualized. At present it is a palace for epicures; and for the sake of the nation's health all should be epicures in respect of food—they should prefer good food to bad. The Nation's Food Exhibition assists the public as to what to buy, where to buy, and what to pay; and visitors are inducted into the very interesting processes of manufacture of the many varieties of foodstuffs.

The "B.C.G.A." Exhibit.

When the present iron-roller system of flour milling was introduced in England about fifty years ago, the English miller claimed that there could be nothing better for grinding wheat than the time-honoured millstones, by the use of which the valuable food constituents of the grain were retained in the meal. The roller system has certainly led to the almost exclusive production of a white flour containing little of these elements. Wholemeal flour, however, as ground in millstones, even with much of the bran sifted out, is somewhat heavy; and this applies particularly to British wheat, which is naturally soft. It would seem, therefore, that there is a necessity for a new mechanical means by which a really pure and satisfactory wholemeal flour can be efficiently and economically produced. With this object in view the "Kek" mill has been specially adapted. It is manufactured by the Chemical Engineering Company, Ltd., of Manchester. This firm show how, with a gas-engine driven mill, good flour can be produced; and the British Commercial Gas Association, on the same stand, demonstrate how efficiently this flour can be baked in the gas oven. The appliances employed for the work are two "New World" raised cookers, and the cakes made are sold to the public. The combined exhibit is excellently arranged, down to the smallest detail. A Richmond water heater is used for washing-up purposes.

Other Exhibits of Interest.

Two exhibits of Messrs. Radiant Heating, Ltd., who show a representative selection of their apparatus, which is well known to gas engineers, are of particular interest. One is a water heating unit. This is in the form of a totally immersed tube, and the gas burns in contact with its own products of combustion. The other is a toaster and griller which is a new departure in that it does not require additional air pressure. The National Gas Engine Company have a 2½-kw. lighting set consisting of a standard National town-gas engine and chain-driven dynamo. The set is supplied with a totally-enclosed silent inverted tooth chain running on machine-cut chain wheels. There is also an "RL" type town-gas engine, embodying all the latest improvements, and capable of developing 32 B.H.P. Messrs. Benham & Sons, Ltd., make a special feature of their "Victor" dish-washing machine, which can be heated by gas This efficient apparatus is installed at the Hotel Cecil, Messrs. Selfridge, Ltd., and many other important establishments, and on many liners. They also show a general range of their gas-fired appliances, including pastry ovens, &c. Gas-fired chip potato ranges and heavy gas ovens are shown by Messrs. Mabbott & Co., Ltd. "Cling-Surface" preparation for belts, enabling them to transmit 100 p.ct. load while running slack, and "Permac" jointing material are exhibited by Messrs. Thomas & Bishop, Ltd. Industrial trucks of all descriptions are shown by Messrs. W. Goodyear & Sons, Ltd.; a special feature being the Goodyear-Greenbat electric truck.

Safeguarding of Gas Mantles.—The Board of Trade have appointed a Committee, consisting of Sir Frederick Mills, Sir John Barran, and Mr. J. Arthur Aiton, to inquire into and report upon an application made by the Incandescent Mantle Manufacturers' Association for the imposition of a duty upon gas mantles. The Secretary to the Committee is Mr. C. K. Hobson, Board of Trade, Great George Street, London, S.W. 1, to whom all communications relating to the work of the Committee should be addressed.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Electrical Explosions.

Sir,—In your issue for April 15 there is a paragraph in the Electricity Supply Memoranda dealing with the cause of explosion in cable conduits. Some time ago a possible immediate cause came to my notice; and as I have not seen any mention of a similar case elsewhere, I think it should be put on record. An electrical fitter brought me a small piece of pasty material which he had found adhering to the side of a bricked manhole through which access to a conduit was gained. His attention had been attracted to it when a similar piece, thrown out on to the roadway, had fallen into a pool of water, and apparently given out sparks. On examination I found the paste contained metallic sodium—no doubt from the electrolysis of some sodium salt contained in the materials of the conduit, by stray currents from a fault in the cable. Dropping water on to the mass caused a copious shower of sparks. The effect of such an occurrence on any explosive mixture of gases in a closed conduit requires no further comment.

Arthur Forshaw.

Falkirk, April 23, 1925.

Hiring Charges and Installation Delays.

Sir,—I have read your criticism of electric cookers on pp. 173-4, and am glad to learn that you consider all arrangements made for supplying gas-cookers absolutely perfect.

When you quote the trifling sum of £4 for a gas-cooker, I begin to wonder what kind of gas-cooker it is. I have yet been unable to discover a sample which is at all efficient under £10. In my area, the Gas Company have discarded the hiring system, and the householder must buy the gas-cooker outright, and wait a minimum of three weeks for installation. I think you could devote your energies to the question of delivery dates in the supply of gas appliances, since I, at least, consider that three days is a reasonable period for installation, and not a general average of three weeks. The gas industry, as far as the area in which I live is concerned, only requires a little publicity with regard to its delivery dates to be discredited.

As to the hiring of gas fires, which is a matter you overlook, I find myself saddled with the trifling sum of 32s. per annum for the hire of two gas-fires, which are not at all efficient. You will note that 32s. is equivalent to an interest charge, at a rate of 6 p.ct., on a capital sum of £27. Even allowing for depreciation, you will see that no electric fires can compare with those gas-fires in price. There are few electric fires on the market which cost more than one-sixth of this sum. The gas industry has a long record of profiteering to overcome in the hiring of appliances especially and of inefficiency in installation before it can criticize the electrical industry; and I think you could devote some part of your musings to working conditions in the gas companies of the Metropolis.

Hugh Quigley.

London, April 21, 1925.

[We are not clear as to why our correspondent considers that the criticisms made in "Electricity Supply Memoranda" for April 15 of a paper by Mr. R. Hardie, of Glasgow, gave the impression that we regard as absolutely perfect all arrangements made for supplying gas cookers. Throughout the criticisms there was no indication of such an idea on our part. Indeed, constant readers of the "Journal" know full well that we are frequently pegging-away at gas undertakings which are negligent as to the service they render to consumers, while at the same time praising those go-ahead ones which take a pride in building-up a reputation and permanent business by looking well after the interests of their patrons. As to the price of gas cookers, we were unaware that we gave £4; it was Mr. Hardie who quoted that figure for a gas cooker, and £12 10s. for an electric cooker. Mr. Quigley wonders what kind of gas cooker a £4 one can be, as he has not yet been able to discover one which is at all efficient under £10. We think that, if he applies to any of the well-known makers of gas cookers, they will be able to introduce him to several types which can be purchased for much less than £10. One large maker quotes a little over £3 for single case cookers, and about £6 for double case ones in much better finish. Quite modern cookers, giving the consumer high efficiencies and with modern accessories, can be bought for £7 to £8; and much more expensive ones can be obtained. But there is not at all a bad selection of cookers suitable for hiring purposes which are purchasable at round about the £4 mentioned. If our friend would like a cooker with the oven externally heated, we can introduce him to some at prices ranging between £8 8s. and £10, or higher prices still. The higher prices for modern types are usually due to size, more accommodation, and finish, rather than to a greater thermal efficiency. As to our correspondent's general criticism of the Company supplying in the district in which he resides, any grievance he has is purely a matter for him to settle direct with the Company. But we would suggest to him that he would find it more profitable to purchase outright two good gas fires than to continue paying the rental figure to which he refers. Of course, we do not know the conditions attached to the charge—whether or not it includes the periodical inspection, adjustment, and maintenance of the fires. But as to their being not at all efficient, there is no reason why any gas fire should be in existence which is not giving to the room in which it is used 70 to 75 p.ct. of the heat generated by the combustion of the input of gas. With confidence it can be claimed that we have had personal experience of a greater number of gas fires than our correspondent, and over a course of years no doubt far exceeding his acquaintance with them. We are always able to obtain from them a high degree of efficiency with gas of a calorific value of 500 B.Th.U. per c.ft. Whatever grievances our correspondent has against his own Gas Company should not be used as representing general conditions throughout the gas industry.—Ed. "G.J."]

REGISTER OF PATENTS.

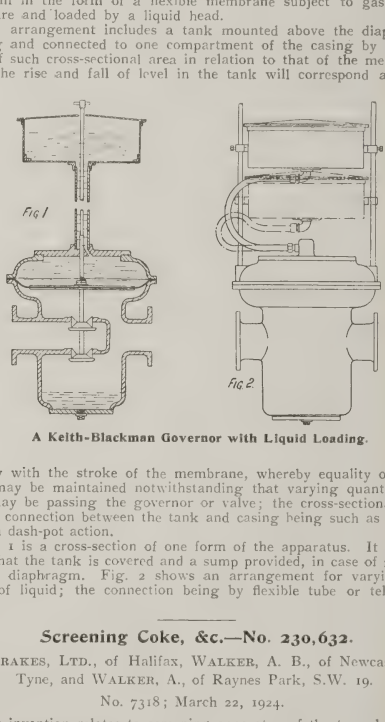
Loading Governors.—No. 230,266.

Keith & Blackman Co., Ltd., and Keith, G., both of Farringdon Avenue, E.C.

No. 5590; March 4, 1924.

This invention relates to a diaphragm loading arrangement for gas governors and other valve apparatus of the type including a diaphragm in the form of a flexible membrane subject to gas or air pressure and loaded by a liquid head.

The arrangement includes a tank mounted above the diaphragm casing and connected to one compartment of the casing by a tube, and of such cross-sectional area in relation to that of the membrane that the rise and fall of level in the tank will correspond approximately with the stroke of the membrane, whereby equality of pressure may be maintained notwithstanding that varying quantities of gas may be passing the governor or valve; the cross-sectional area of the connection between the tank and casing being such as to produce a dash-pot action.



A Keith-Blackman Governor with Liquid Loading.

Fig. 1 is a cross-section of one form of the apparatus. It will be seen that the tank is covered and a sump provided, in case of rupture of the diaphragm. Fig. 2 shows an arrangement for varying the head of liquid; the connection being by flexible tube or telescopic pipe.

Screening Coke, &c.—No. 230,632.

Drakes, Ltd., of Halifax, Walker, A. B., of Newcastle-on-Tyne, and Walker, A., of Raynes Park, S.W. 19.

No. 7318; March 22, 1924.

This invention relates to screening apparatus of the type described in specification No. 8439 of 1914 [abstracted, with drawings, on p. 400 of Vol. 130 of the "Journal."]

The patentees now claim, as modifications, the employment of adjustable fingers and means for securing same so that openings of the sieve may be increased or decreased in width; and the employment of additional finger pieces having slots to permit of their adjustment relatively to the pieces on which they are mounted, and bolts for securing them.

Extraction of Coke from Vertical Retorts. No. 230,518.

Woodall, Duckham, & Jones (1920), Ltd., and Sir Arthur M'D. Duckham, both of Grosvenor Gardens, S.W. 1.

No. 28,529; Nov. 12, 1923.

The patentees point out that one method of governing the issue of coke from the lower end of a continuous vertical retort consists in making the bottom of the retort a separate piece carried in a gas-tight casing by a support capable of vertical reciprocating motion within the stationary casing. According to the present invention the casing is made the reciprocating part, and its bottom the bottom of the retort; the arrangement avoiding the necessity for removing the coke from a gas-tight casing.

The casing which has received its charge of coke is removed from

the retort; and its place is taken immediately by another, or it is emptied quickly and replaced. Inserted bars temporarily support the charge in the retort during the removal of the casing.

Conveniently, the casing also forms the necessary seal for the bottom of the retort. To this end there may be a fixed depending mouthpiece, or extension of the retort, surrounded by a metal curtain, and the vertical walls of the container may be double so as to hold water into which the metal curtain dips.

To prevent the entrance of air into the retort when the container has been removed, steam jets may be provided in the extended portion of the retort, the jets producing a slight pressure.

Purification of Crude Ammoniacal Liquors.

No. 230,705.

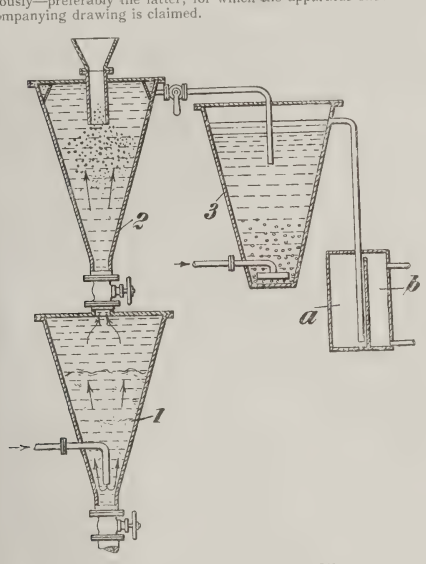
Potts, H. E., of Liverpool.

(A communication from Z. M. Stinnes, of Essen-Ruhr.)

No. 17,742; July 25, 1924.

This invention is for a two-stage process of purification for crude ammoniacal liquor. The tarry matters are first removed and the phenols are then extracted in a substantially pure condition. In the first stage the crude ammoniacal liquor is treated with a solid adsorbent, such as calcium carbonate, alumina, sawdust, wood-charcoal, &c., which fixes and binds the finely divided and suspended tarry drops. The dirty mass thus produced is separated in the usual manner, and the clarified ammoniacal liquor is now, in the second stage of the process, extracted with a solvent such as benzene, preferably at an elevated temperature, whereby the phenols are quickly dissolved. The mixture of the two liquors is allowed to separate under gravity, and from the benzene extract the phenols are obtained in a pure state by distilling off the solvent, while at the same time the benzene is not adulterated by tar and can be used again for another operation without purification.

In practice the process is carried out either intermittently or continuously—preferably the latter, for which the apparatus shown in the accompanying drawing is claimed.



Purifying Crude Ammoniacal Liquor—Stinnes.

The adsorbent is fed into the container 2 by means of a funnel having an elongation. The crude ammoniacal liquor enters the bottom of the container 1 by way of a pipe bent downwards. It continually flows upwards and meets in a counter-current the adsorbent, of which a portion gradually sinks downwards into the container 1. The rate of flow of the liquor is regulated in such a manner that the greater portion of the adsorbent is kept in suspension at about the middle of the container 2, where it adsorbs the tarry matter, together with which it gradually sinks down as a greasy mass into the bottom of container 1, whence it is run off from time to time by opening the bottom valve.

The ammoniacal liquor thus freed from the tarry matter overflows from container 2 into another container 3 of similar shape; the adsorbent being retained in container 2 by a screen or sieve. At the same time benzene in a finely divided state is allowed to rise in pearly drops (by means of a pipe and rose) from the bottom upwards in the container 3, where it extracts the phenols dissolved in the aqueous liquor. The mixture of water and benzene is continually withdrawn and run into the bottom of a tank provided with a division wall, so that the aqueous liquor can overflow from the compartment *a* into *b*, in which latter compartment the separation of the benzene top layer from the aqueous bottom layer is effected. The benzene extract is run off into a collecting tank and thence to a distilling apparatus to recover the benzene (for re-use) and the phenols, while the purified ammoniacal water is carried away and treated for the production of ammonia.

The ammoniacal liquor before entering the top container 3 should be warmed to 40° to 45° C., so that the benzole drops may ascend through the warm water, whereby a great saving of time and benzole is effected.

The waste water from the ammonia stills can then be run into (say) a river, and, being free from tar, phenols, &c., can do no harm to the fishing industry.

Gas Cookers.—No. 230,921.

Helps, G., of Nuneaton.

No. 31,929; Dec. 20, 1923

According to this invention, which has for its object to allow hotplates of a standard size to be used for cookers of varying size, a hotplate with its burners forms a separate entity, detachable from the cooker, and is so carried by a base plate, a frame, or two strips, that it can rest on the cooker, to which it may be secured by screws. The hotplate may be so supported on the base plate, frame, or strips as to provide a channel in which a crown plate can slide.

The arrangement allows a large hotplate to be conveniently supported from the top plate of a small cooker, or a small hotplate to be supported on a larger cooker, and in each case fixed in a few moments.

APPLICATIONS FOR PATENTS

[Extracted from the "Official Journal" for April 22.]

Nos. 9501 to 10,183.

Allott, G. W.—"Manufacture of coal gas." No. 10,046.
Bader & Salau.—"Production of air-gas mixtures." No. 9677.
Carpmael, W.—"Distillation of bituminous materials." No. 9964.
Chase, F. C. B.—"Gas-heated soldering-irons, &c." No. 9978.
Cornes, J.—"Gas saver." No. 9875.
Cox, K.—"Recovery of benzole, &c., vapours from gas-vapour mixtures." No. 9966.
Enoch, A. G.—"Air or gas compressors." No. 9632.
Guhler, R.—"Gas burners." No. 9942.
Helps, G.—"Gas burners." No. 10,019.
Jackson, W. J. Mellersh- (Koppers Company).—"Aeration and gas purification." Nos. 9675, 9679, 9694.
Jackson, W. J. Mellersh- (Koppers Company).—"Gas purification." Nos 9681, 9701.
Jackson, W. J. Mellersh- (Koppers Company).—"Gas and liquid contact apparatus." No. 9690.
Jackson, W. J. Mellersh- (Koppers Company).—"Removal of hydrogen sulphide, &c., from gases." No. 9698.
M'Dermott, P. J.—See Cox, K. No. 9966.
Macdonald, F. R.—"Gas fires, &c." No. 9940.
Miles, T. V.—See Allott, G. W., No. 10,046.
Pyzel, D.—See Carpmael, W. No. 9964.
Reber, J. W.—"Waste-heat boilers." No. 9987.
Smith, E. W.—See Reber, J. W. No. 9987.
Toogood, H. J.—"Stoking-appliances for gas-works retorts." No. 9655.
Woodall-Duckham (1920), Ltd.—See Reber, J. W. No. 9987.

LEGAL INTELLIGENCE.

EXTRACTION OF TOLUOLE.

Dr. Davidson's Claim on the War Office.

On Monday the Royal Commission on Awards to Inventors (presided over by Mr. Justice Tomlin) heard a claim by Dr. W. B. Davidson for compensation by the War Office in respect of processes for the extraction of toluole from coal gas. Mr. Whitehead, K.C., and Mr. James Mould appeared for the applicant; Mr. Courtney Terrell and Mr. D. H. Corsellis represented the War Office.

Mr. Whitehead said the claim was made under clause 3 of the Royal Commission by the applicant, William Brown Davidson, who was a gas engineer, a consulting chemist, a Doctor of Science, a Doctor of Philosophy, and a Fellow of the Institute of Chemistry. At the time the process was evolved which was the subject of the claim, he was with the Birmingham Corporation. Some time ago there was presented to the Commission a claim on behalf of Dr. Rother and Dr. Palmer, who were employed at the Royal Arsenal, Woolwich, in respect to the manufacture of "T.N.T.;" but the Commission took the view that their status debarred them from obtaining a reward. In the course of that claim, it appeared that the first steps with regard to the manufacture of "T.N.T." were taken quite early after the outbreak of war; and no sooner did it become plain that there was a chance of manufacturing toluole on a large scale, than it became evident that the supply of toluene would have to be considerably increased. This was recognized at the Royal Arsenal; and Dr. Rother at the beginning of November, 1914, communicated with Dr. Davidson with regard to the best means of adding to the supply of toluene. Various suggestions were made by letter, and Dr. Davidson's opinion was asked as to the possibility of obtaining toluene by synthetic processes. In reply, Dr. Davidson criticized the suggestion made; but after thinking about the matter, he evolved the process in question on Dec. 28, 1914. Dr. Palmer was not satisfied with the work; but he thought it was his duty to bring it to the notice of his Chief, and the matter was submitted to Lord Moulton. On Jan. 11, 1915, Dr. Davidson was sent for by Lord Moulton, to whom he explained the process. Lord Moulton was favourably struck with the scheme, because a little later he telegraphed to Dr. Davidson, and arranged for a meeting to be held at the Grand Hotel, Birmingham, at which Sir H. Rogers (the Chairman of the Gas Committee) and Captain R. S. Hilton (the Secretary and Manager) were present. The process was fully discussed, and

in the result the applicant was asked to arrange for the erection of plant at the Nechells Gas-Works. Applicant was also asked to visit the gas-works at Manchester, Sheffield, Coventry, and other towns, to explain the scheme; and Captain Hilton was directed by Lord Moulton to speed-up the erection of the necessary plant at the different works, in order to carry out the process. It took 3½ months to erect the plant at Nechells, where afterwards the process was carried out. When it was working, it was visited by many English and French gas engineers, with the view of their adopting a similar plan. Dr. Davidson also, at the request of Lord Moulton, proceeded to various parts of the country to give his help and advice with regard to the erection of plant and its working; and he received his travelling and hotel expenses for that work from the Government. The real problem was to obtain as much toluene as possible from the coal gas, and yet to supply a gas which would not be substantially impoverished either with regard to calorific value or light-giving properties. He might mention that no patent had been taken out in respect of the process in question. Counsel produced a diagram, and explained how the process was carried out. He said there was no part of the process, except one, which had not been anticipated; but no one had ever previously carried out the process in its entirety.

Mr. Terrell asked that the invention should be defined, in order that he might deal with it. At present he did not know what it was.

The President understood it consisted of the entire process indicated on the diagram.

Mr. Whitehead said that was so. In order to perform the work, a number of things had to be carried out which involved an immense amount of research work. This was done by Dr. Davidson at his own expense and in his own time.

The President said no claim for expenses could be substantiated in respect of this, except so far as it was incidental to some other claim.

Mr. Whitehead agreed that this was so. The claim made in respect of expenses and research work was £510.

The President pointed out that the actual out-of-pocket expenses had been paid. It might be that Dr. Davidson was not free to contract with the Government, as his services belonged to the Birmingham Corporation. For aught one knew, it might be that the Corporation lent Dr. Davidson to the Government, and put up with the loss of his services on the footing that his out-of-pocket expenses were paid.

Dr. *W. B. Davidson* was then called, and gave evidence in support of his claim. He said the experiments were done at the works in his own time, and he expended considerable sums on apparatus and chemicals. He had never received anything from the Birmingham Corporation in respect of this work.

The hearing was adjourned till Monday next.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following notice has appeared in the "London Gazette" regarding an application to the Board of Trade under the Gas Regulation Act.

SPECIAL ORDER

Bollington Urban District Council.

The Council intend to apply to the Board of Trade for an Order under section 10, to extend their gas supply limits, to authorize the purchase of additional lands, to enable them to charge on the thermal basis, and for other purposes.

TRAGEDY AT NEWPORT.

No Blame Attached to Gas.

On Monday, April 20, an inquest was held at Newport (Mon.) on Mr. F. Vaughan, a well-known Newport and Cardiff solicitor, and his wife, who were found dead in their bedroom on April 16. The tragedy was discovered by Dr. R. W. Haslett, who had for some time been attending Mr. and Mrs. Vaughan for heart trouble, at three o'clock in the afternoon. In giving evidence, Dr. Haslett said that, when he called at the house, the maid told him that deceased were asleep. On entering the bedroom, however, he discovered that they were dead. A gas fire, fully alight, was burning in the room, which was very oppressive; the air temperature being no less than 115° Fahr. Dr. V. A. Crinks, who conducted the post-mortem examination, gave the opinion that death was due to asphyxia from carbon-monoxide poisoning.

Mr. J. H. Canning, the Engineer and Manager of the Newport Gas Company, said that on Friday, April 17, he examined the gas fire, and found it in perfect order. The top of the fire was covered with a deposit of what appeared to be mortar, and a similar deposit lay on the hearth. He tested the chimney for draught, and found it inoperative. The flue was then inspected, and an obstruction was found some 12 ft. above the hearth. This consisted of two or three bucketfuls of sticks, twigs, fine mortar, clay, and the skull of a bird. The latter indicated that a nest had been in the chimney for some time. The nest could not, however, have actually sealed the flue; for on March 11 the fire was examined by one of the Company's fitters, and the chimney draught at that date was perfect. The blockage was probably caused by mortar falling from the portion of the flue above the nest, and closing all the small openings.

The Coroner, Mr. W. Lyndon Moore, D.L., J.P., said that it was satisfactory to know that death was not due to the fault of anyone, but was rather the neglect of the old rule which told them to keep their chimneys clean. It was clear that on March 11 there had been a proper current of air ascending the chimney. No doubt the opinion advanced by Mr. Canning was a sound one.

The foreman of the jury intimated that they were unanimously of the opinion that death was due to misadventure.

METROPOLITAN GAS COMPANIES' OFFICIAL TESTINGS.

The Gas Referees' reports of the official testings for the past quarter give the following average calorific values for the gas supplied by the Metropolitan Companies named.

Brentford Gas Company.—501·3 B.Th.U. (declared calorific value, 500 B.Th.U.).

Commercial Gas Company.—476·8 B.Th.U. (declared calorific value, 475 B.Th.U.).

Gas Light and Coke Company.—501·8 B.Th.U. (declared calorific value, 500 B.Th.U.).

South Metropolitan Gas Company.—562·6 B.Th.U. (declared calorific value, 560 B.Th.U.).

South Suburban Gas Company.—501·5 B.Th.U. (declared calorific value, 500 B.Th.U.).

Tottenham District Light, Heat, and Power Company.—503·7 B.Th.U. (declared calorific value, 500 B.Th.U.).

Wandsworth, Wimbledon, and Epsom District Gas Company.—474·5 B.Th.U. (declared calorific value, 470 B.Th.U.).

BOMBAY GAS COMPANY, LTD.

The report of the Directors, which will be presented at to-day's meeting of the Company, shows a profit of £21,761, which, added to the profit on exchange, £5185, and the balance of £35,051 brought forward from the previous year, amounts to £61,997. After providing for the payment of interest, &c., and the interim dividend paid in November last, and the addition of £1404 to the reserve fund, £997 to the renewal fund, and £184 to the insurance fund, there remains a balance of £46,208, out of which the Directors recommend the payment of a dividend of 4 p.ct. (less income-tax), making 8 p.ct. for the year, which will leave £34,208 to be carried forward to the current year. The Directors announce with profound regret the death of their esteemed colleague and friend, Mr. Henry Edward Jones. They place on record their deep appreciation of the important and valuable services which he rendered to the Company as a Director for a period of 33 years—for 21 years of which he was Chairman of the Board—and their sense of the loss which the Company have sustained by his death. Mr. Stanley Hunter Jones, M.Inst.C.E., has been appointed to fill the vacancy on the Board. Mr. A. R. Burch, the Company's Engineer and Manager in Bombay, resigned his office in October, 1924, owing to ill health. He was the Company's representative in Bombay for 18 years, and fulfilled the duties of his office to the entire satisfaction of the Directors and with great advantage to the Company. They have appointed the Deputy Engineer and Manager, Mr. W. T. Lane, in his place. It is intended to increase the nominal capital of the Company by the creation of new ordinary shares of £1 each.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *April 27.*

Pitch continues without material change. There is still a moderate amount of inquiry for this season's delivery: but buyers' ideas of value are low. The price to-day is nominally 41s. to 42s. per ton f.o.b. works. There is a certain amount of interest being taken already in business for next season.

Creosote is quietly steady at about 7d. per gallon net and naked at makers' works.

Pure benzole and pure toluole remain at about 1s. 10d. per gallon.

Solvent naphtha, 95/160, is firm at about 1s. 8d. per gallon.

Tar Products in the Provinces.

April 27.

The average values for gas-works products during last week were: Gas-works coal-tar, 27s. 9d. to 32s. 9d. Pitch, East Coast, 40s. to 41s. f.o.b. West Coast—Manchester, 35s. to 36s.; Liverpool, 36s. to 37s.; Clyde, 39s. to 40s.; Benzole, 90 p.ct., North, 1s. 6¼d. to 1s. 7¼d.; crude, 65 p.ct., at 120° C., 10d. to 1s., naked at makers' works; 50-90 p.ct., naked, North, 1s. 6¼d. to 1s. 7¼d. Toluole, naked, North, 1s. 6¼d. to 1s. 7¼d., nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8¼d. Solvent naphtha, naked, North, 1s. 5d. to 1s. 6d. Heavy naphtha, North, 1s. to 1s. 2d. Creosote, in bulk, North, liquid, 6d. to 6¼d.; salty, 5¾d. to 6¼d.; Scotland, 5¾d. to 6d. Heavy oils, in bulk, North, 6¾d. to 7d. Carbolic acid, 1s. 5d. to 1s. 6d. prompt. Naphthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality 2½d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Successful Capital Issue at Barnet.—With regard to the sale by tender of £15,000 of "D" capital gas stock of the Barnet District Gas and Water Company, which was recently advertised in our columns, it may be mentioned that the stock was applied for more than twice over; the prices tendered ranging from £116 to £110 per £100 of stock. The average price realized was £112 1s. 10d., and the lowest price to receive allotment £111.

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

There has been, if anything, a slightly brighter feeling in the market during the past week, but without very much change in prices. It may be due, in some measure, to the Easter holiday of the previous week, or in some cases—for instance, that of coking coals—to a small increase in prompt inquiry combined with the limitation of output. It will be difficult for prices to rise much on the latter score, because so many collieries are closed, or working short time, which could open out and produce more coal if better prices were obtainable.

There is little news of the doings of the Joint Committee, except the disparaging remarks of the Miners' Secretary. It appears that their sittings are not yet concluded. At any rate the two parties can hardly have failed to agree about the seriousness of the situation.

As already mentioned, there has been slightly better inquiry for prompt shipments of coking coals, and unscreened makes have been firmer at 17s. 6d. to 17s. 9d. for good qualities. Gas coals, however, have shown an easier tendency. Wear Specials quote 19s. 6d. to 20s. f.o.b., but for prompt tonnage there is little difficulty in obtaining them at 19s. The same applies to best qualities, which quote 19s. 6d. to 19s. 9d. Seconds are nominally 17s., and, while some makes are steady at this price, others are obtainable at 16s. 6d. Durham unscreened bunkers are unchanged at about 18s. for best qualities.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

Stocks at the pithead do not seem to have been appreciably relieved as a result of the Eastertide suspension. A few collieries in the district are working full time; but their activity is due to exceptional conditions, output over the whole area being on a decidedly lower scale than before the holidays. The market outlook is exceedingly dejected. Values generally are unstable. Pressure to sell causes great irregularity of prices. Buyers can pick up odd lots at bargain rates; but there is such an utter lack of confidence that speculation is smothered. The only firm features are D.S. nuts and slacks. Price consolidation there is due not to expansion of demand but to contraction of supply owing to the drying-up of the house coal trade. Nuts and slacks command substantially better prices than could be got when the domestic trade was more active.

Blast-furnace coke is in very slow sale. Following the suspension of a basic furnace in South Staffordshire, a Derbyshire furnace which has been smelting foundry pig is being stopped; so that there will be a further displacement. Coke can now be bought at 14s. to 15s., though the basis for the current quarter under the stabilization arrangement is 15s. 9d. The first step is being taken to transfer labour from the Holly Bank pits on the confines of the Black Country to the new electrified Hilton main, where the chief concentration will be henceforward. The decision to close down the Great Wyrley Colliery in the Cannock Chase coalfield is now being given effect to.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

Gas coals in Yorkshire and Lancashire are not in so big a demand as they were a few weeks ago, and there are indications of a reduction in price when contracts are renewed for the next twelve months.

House coals remain fairly steady, and so far prices have not been disturbed to any great extent. Very little alteration in prices is anticipated during the early summer months, owing to the irregular working of collieries.

There is no improvement in the demand for industrial fuel; and although prompt supplies of the lower grade kinds are on offer at low figures, consumers generally are unable to take advantage of this owing to their contract obligations. There is not likely to be an alteration in this direction for some time. The majority of the larger centres report no progress. In Lancashire, there is a fair demand for the best qualities of slacks; but the commoner kinds are down to about 11s. per ton. Prices at the Lancashire pits are unchanged, and no alteration is probable until after June.

The slump in export fuel still continues, although some collieries are endeavouring to meet the situation by accepting low prices; but it is a question whether this can be continued for long, owing to the heavy costs of production.

Prices at Hull at the week-end were: Bunker and export coal, f.o.b. usual shipping ports. South Yorkshire: Hards, Association, 19s. 9d. to 20s. 6d.; screened gas coal, 19s. to 19s. 6d.; washed trebles, 20s. 6d.; doubles, 17s. 3d. to 17s. 9d.; singles, 17s.; smalls, 13s. 3d.; unwashed doubles, 15s. 9d. to 16s. 3d.; rough slack, 10s. 6d. to 11s.; smithy peas, 20s. to 20s. 6d. per ton. West Yorkshire: Hartley's, 17s. to 18s.; screened gas coal, 18s.; washed trebles, 18s. 6d.; doubles, 17s. 6d.; singles, 17s.; smalls, 12s. 9d.; unwashed trebles, 18s.; doubles, 13s. to 13s. 6d.; rough slack, 10s. 3d. to 10s. 6d.; coking smalls, 9s. 6d. to 10s. 6d. per ton. Derbyshire and Notts: Top hards, 17s. 6d. to 19s. 9d.; washed trebles, 17s. 9d.; doubles, 17s. 6d. to 18s.; singles, 17s.; smalls, 12s. 9d.; unwashed doubles, 15s.; rough slack, 10s. 6d. to 11s. per ton. Yorks, Derby, and Notts: Screened steam coal, 15s. to 17s.; gas coke, 22s. to 23s. 6d.; furnace coke, 17s. to 17s. 6d. per ton.

Cardiff Gas Company's Athletic and Social Club.—The fourth annual meeting of the Club was held on Friday, April 24. In the Secretaries' report reference is made to the excellent work which the late Mr. George Clarry did for the Club. The report goes on to say that they "are fortunate to have secured, to fill the vacancy of President, Mr. H. D. Madden." The accounts were closed on March 31; and the balance-sheet shows the substantial sum of £228 to the credit of the Club. The meeting was held at the Grand Hotel; and after the business proceedings a musical programme was enjoyed.

TRADE NOTES.

"Gas Cookers for 1925."

Stoves, Ltd., of Scotland Road, Warrington, have recently issued a new catalogue bearing this title. The cover is most attractive, and is in keeping with the appearance and quality of their cookers.

Tar Plant for Dewsbury.

The Gas Department of the County Borough of Dewsbury, on the recommendation of their Engineer and Manager, Mr. H. L. Bateman, have placed an order with the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., for a tar dehydration plant (T.I.C. lead bath), to produce tar to the Road Board specification. The plant has a capacity of 10 tons a day.

Pyrometers.

The Bowen Instrument Company, of No. 9, Newton Road, Leeds, have published two pamphlets in which are described the "Pyro" insertion pyrometer and an electrical pyrometer designed to measure the temperatures of type-metal in printers' casting plants. The "Pyro" instrument is designed for workshop use in aluminium and non-ferrous foundries, in which there has been a great demand for a rapidly operating pyrometer.

The New Gladstone Dock.

Messrs. Stothert & Pitt, Ltd., of Bath, have received an order for 27 electric jib cranes of their latest pattern crank-operated horizontal luffing type. Nineteen of these will have a lifting capacity of 3 tons at 74 ft. 9 in. radius, or 1½ tons at 85 ft. 9 in.; and the other eight cranes will deal with 1 ton at 48 ft. 6 in. radius. These 27 cranes, together with 31 similar ones which the firm are now building, form the complete equipment of the new Gladstone Dock.

The Automatic Light Controlling Company, Ltd.

The Bournemouth Corporation have just agreed to renew their contract with the British, Foreign, and Colonial Automatic Light Controlling Company, Ltd., of No. 100, Holdenhurst Road, Bournemouth, for a further term of five years, for the hire of "Gunfire" controllers. Their first contract was in 1900, when the number was 162. The contract has been continuously renewed, and the number has increased till now it is between 3000 and 4000. This does not include nearly 2000 used by the Bournemouth Gas and Water Company. The town of Luton have recently placed an order for "Gunfire" controllers.

The "Du-Ex" Expansion Nipple.

The "Du-Ex" (double expansion) nipple, manufactured from specially-drawn steel tubing, is a short length of tube so machined as to form two annular internal beads. These occur at the end which is to be inserted in a tapped main. The lower bead is located at the extremity of the nipple, so that, when expansion takes place, the nipple will be riveted inside the main. The upper head is at such a distance therefrom that the nipple will also be expanded or riveted on the outside of the main. The intervening diameter is thereby pressed outward by this dual expansion; and thus the screwed portion of the nipple, which fits into the main, is so tightened that perfect contact of the threads is assured. A booklet describing this nipple has just been published by the manufacturers—Messrs. J. Stone & Co., Ltd., of Deptford, London, S.E. 14. (London Office: Oceanic House, No. 1a, Cockspur Street, S.W.1.)

CONTRACTS OPEN.

Coal.

Tenders are invited by the County Borough of Dewsbury for the supply and delivery of 16,000 tons of gas coal and nuts. [See advert. on p. 327.]

The Silsden Urban District Council require tenders for the supply of 2600 tons of gas coal covering a period of twelve months. [See advert. on p. 327.]

The Gas Committee of the Congleton Corporation are inviting tenders for the supply of 6000 tons of washed gas nuts or beans. [See advert. on p. 327.]

Tenders are invited by the Sidmouth Urban District Council for the supply of about 3000 tons of Yorkshire screened coal for their gas and electricity works. [See advert. on p. 327.]

The Gas Committee of the Nantwich Urban District Council are prepared to receive tenders for their requirements covering twelve months of screened gas coal and washed gas slack or nuts. [See advert. on p. 327.]

EXTENSIONS.

Telpher Plant at Chesterfield.

The Chesterfield Gas Committee have decided to extend the telpher track in connection with the new retort installation at the Central Gas-Works, at an estimated cost of £186.

Extensions at Oswaldtwistle.

At a meeting of the Oswaldtwistle Council on April 23, Mr. R. Dawson (the Chairman) said that among the new schemes which the Council would have to tackle during the coming year was an extension of the gas-works, at a cost of £21,000.

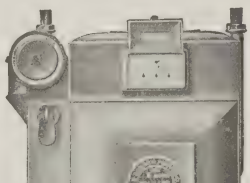
City of Santos Improvements Company, Ltd.—The annual meeting of the Company was held on Wednesday, April 22—Mr. N. B. Dickson, M.Inst.C.E., presiding. Referring to the gas undertaking, he said that the reduction in the price of gas had benefited the receipts. During the year, 357 additional heaters, and 71 water heaters, were connected. There was a strong demand for residuals; and good prices were realized. Residuals returned 47·89 p.ct. of the cost of coal, as compared with 46·31 p.ct. in 1923. The working results were more encouraging than for some years past; and they anticipated better results for the current year, provided there was no appreciable fall in exchange.

THE

OLD VICTORY,

AND THE

NEW—



BOTH SUPREME!

SAWER & PURVES,

MILES PLATTING, MANCHESTER.

RADFORD ROAD, NOTTINGHAM.

45-47 WESTMINSTER BRIDGE RD., LONDON, S.E.1.

Metrogas Operatic Society.

The members of the recently formed Metrogas Amateur Operatic Society are to be congratulated on the success which attended their third production. The selection on this occasion was Gilbert and Sullivan's "Iolanthe," by permission of Mr. D'Oyly Carte; and the hall of the Co-Partnership Institute at the East Greenwich Works of the South Metropolitan Gas Company was taxed to its limit to accommodate the audiences during the four performances—on Wednesday, Thursday, Friday, and Saturday of last week. The caste (all the members of which, together with the Producer and Musical Director and the orchestra, are employees of the South Metropolitan Gas Company) was well selected; and their excellent rendering met with an enthusiastic and much applauded reception throughout. At the concluding performance on Saturday, the principal lady members of the caste were the recipients of numerous floral and other tributes.

Debenture Stock for Haywards Heath.—Among the advertisements in this issue will be found an offer by Messrs. A. & W. Richards for sale by tender of £12,000 of 5 p.ct. perpetual debenture stock of the Haywards Heath District Gas Company. The minimum price of issue is £95 per £100 of stock; and the latest time for the receipt of tenders is Thursday morning, May 7. The money is required in connection with the recent purchase of the undertaking of the Cuckfield Gas Company, Ltd.

Budleigh Salterton Gas Company.—At the annual meeting of the Budleigh Salterton Gas Company, the report and accounts were adopted. The growth of the Company in every direction was referred to by the Chairman, who said more gas was sent out now than had ever been recorded in the history of the undertaking. There was every prospect of continued expansion, as the district served was becoming very popular as a residential area. The price of gas had been reduced by 1d. per therm. He did not think the shareholders had any cause for anxiety as to the effect of the electric competition in the town.

Gas Main Extensions at Carlisle.—Extensions of Carlisle gas mains to Dalston and Burgh-by-Sands are much appreciated by the inhabitants, who, according to a communication to the "Daily Chronicle" by their special correspondent, will receive gas at 3s. 6d. per 1000 c.ft. Mr. J. P. Buck (the Chairman of the Gas Committee) points out that even at Burgh there are already 61 consumers in the village, and of these more than one-half have cookers or gas fires. Between Burgh and Carlisle lies Kirkandrew, where 16 of the householders take gas. In Dalston 78 of the householders have taken a supply; and of these, 29 have had cookers fitted, and 16 gas fires. Mr. Buck looks for excellent results from the extension of the supply to these outlying villages.

Improved Results at Llandudno.—The question of an increase in salary to Mr. H. Duxbury, the Gas Manager, came up for discussion at a meeting of the Council last week, when it was proposed by one member that the question be referred back. Mr. J. E. Payne, supporting the increase, said that in 1920 there were dark days in the gas concern, which led them to spend £61,000. They had a cheeseparing policy in those days, and did not consider the Manager. The output of gas since that time had largely increased, and the leakage had been reduced from 11·36 to 7·84 p.ct. Mr. R. C. Baxter (the Chairman of the Gas Committee) said that they were making more gas from less coal. In the past they had spent hundreds of pounds on expert advice, and in Mr. Duxbury they had a man who was clever at his work. The recommendation was adopted.

Welsbach Light Company's Dinner.—On April 17 the annual dinner given to the outside representatives, depot managers, and departmental managers of the Welsbach Light Company, Ltd., was held at the Caledonian Salon, Holborn Restaurant; and the evening proved a tremendous success. Mr. J. R. Yates, the Chairman of the Company, was in the chair, supported by Mr. H. Talbot, the General Manager. A special menu card which had been compiled by Mr. R. H. Palmer caused great amusement, and resulted in creating that atmosphere of conviviality which is so essential to the success of such functions. Embodied in the menu were many extremely humorous advertisements and a column of personal references entitled "Things we would like to know." After dinner the members were entertained to a concert. Interspersed with the musical programme were several speeches; the one given by the Chairman being especially happy. From the various remarks it was obvious that a great feeling of co-operation exists between all members of the firm. Everyone seems to be imbued with the one idea of making each year more successful than the last as regards the firm's prosperity.

The annual report of the Dalton gas undertaking shows that the make of gas has increased during the past year to 18,963,300 c.ft. The amount of gas unaccounted-for was 2,910,800 c.ft., compared with 1,059,500 c.ft. last year.

The annual financial statement issued by the Darwen Corporation shows a loss of £3256 on the gas undertaking, as compared with a profit of £3002 a year ago. The price of gas has remained at 3s. 8d. per 1000 c.ft. throughout the year.

At a meeting of the Clitheroe Town Council on April 22 Mr. J. Boothman, Chairman of the Finance Committee, said the capital account of the gas undertaking was £99,000. Of this, £55,000 had been paid-off out of profits, and there was also £17,000 invested in sinking fund; the present net indebtedness on the works being £18,000.

Two old servants of the Portsea Island Gas Light Company, having reached the extended age limit of 70, have, under the Company's new pension scheme, just retired—Mr. W. Heath after forty years' service, and Mr. J. Martin after thirty. At the Flathouse Works recently, Mr. Mills (the Works Superintendent) expressed the wishes of all for the health and happiness of Messrs. Heath and Martin. To each he presented a cosy easy chair, as a mark of the regard of the Engineer (Mr. T. Carmichael) and all at the Flathouse Works.

STOCK MARKET REPORT.

STRICTLY cheerful conditions prevailed on the Stock Exchange last week, and there was appreciable increase in the volume of business transacted. The absence of alarums and excursions doubtless accounted for the confidence which prevailed. No effect was noticeable on the declaration of the new French Government, but subsequent events both in France and in Germany may still have far-reaching results.

It is rumoured that another effort will be made shortly to reduce the heavy burden of the 5 p.c. War Loan. It is expected that a further offer of conversion to a longer-dated loan will be made, carrying interest at a rate below the 4½ p.c. rate of last year's offer. The prospects, in view of the dearer money at the present time, depend entirely on the price at which the conversion will be made. No further announcement has, at the time of writing, been made regarding the £3,000,000 Birmingham Loan which is to carry interest at 4¾ p.c., but it is expected that the price will be on the high side.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Apl. 24.	Rise + or Fall − on Week.	Transactions Lowest and Highest Prices.
£			%p.a.	%p.a.				
171,978	Stk.	Feb. 5	5	5	Aldershot 5 p.c. max. C.	78–81	..	..
395,492	,,	,,	4	4	Do. 4 p.c. Pref.	77–76	..	..
551,868	,,	Apl. 2	6½	6½	Alliance & Dublin Ord.	66–71	..	66¼–67½
374,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb.	63–68	..	..
300,000	5	Oct. 23	8	8	Bombay, Ltd.	5–5⅛	..	5 1/16–5⅛
100,000	10	Mar. 5	8½	8½	Bournemouth 5 p.c.	12–13	..	..
425,050	10	,,	7	7	Do. B 7 p.c.	12½–12¾	..	..
150,000	10	,,	6	6	Do. Pref. 6 p.c.	11–12	..	..
50,000	Stk.	Jan. 8	3	3	Do. 3 p.c. Deb.	56–59	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	76–79	..	..
992,045	,,	Mar. 5	6 5/16	6 5/16	Brentford A Con.	95–105	..	..
990,500	,,	,,	6¼	6¼	Do. B New	95–105	..	95–98
76,000	,,	,,	5	5	Do. 5 p.c. Pref.	95–98	..	..
306,690	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	76–81	..	..
181,337	,,	,,	6	6	Do. 6 p.c. Rich. Red. Deb.	100–105	..	..
214,740	,,	Mar. 5	11¼	12½	Brighton & Hove Orig.	165–170	..	..
244,200	,,	,,	8¼	9¼	Do. A Ord.	122–125	..	..
287,500	,,	Feb. 19	5	5	Bristol 5 p.c. max.	96¼–97¼a	..	..
855,000	,,	Mar. 19	8	7	British Ord.	113–117	..	110–112
100,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref.	123–128	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	72–77	..	..
100,000	10	Dec. 18	8	6	Cape Town, Ltd.	7–8	..	..
100,000	10	Apl. 23	4½	4½	Do. 4½ p.c. Pref.	6–7*	..	..
150,000	Stk.	Dec. 18	4½	4½	Do. 4½ p.c. Deb.	71–76	..	..
626,860	,,	Feb. 19	6	6	Cardiff Con. Ord.	101–104	..	..
237,860	,,	Jan. 8	7¼	7¼	Do. 7¼ p.c. Red. Deb.	104–107	..	..
157,150	,,	Feb. 19	5	6¼	Chester 5 p.c. Ord.	89¼–94½b	..	..
513,280	,,	Mar. 5	6	5/14/8	Commercial 4 p.c. Cap.	86–89	–1	85½–87½
560,000	,,	,,	6	5⅝	Do. 3½ p.c. Cap.	86–89	–1	86½–87
475,000	,,	Dec. 18	3	3	Do. 3 p.c. Deb.	57–60	..	58½
800,000	,,	14 Jan. 15	—	—	Continental Union, Ltd.	35–40	..	35–35⅜
200,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref.	88–92	..	89–89½
660,000	,,	Mar. 5	6¼	6¼	Croydon sliding scale	100–103	..	..
284,975	,,	,,	5	5	Do. max. div.	83–86	..	..
492,270	,,	Feb. 19	6	9	Derby Con.	110–112c	..	..
55,000	,,	Jan. 8	4	4	Do. Deb.	74–76c	..	..
1002,180	£	Jan. 22	6	4	European, Ltd.	7–8	–¼	7–7½
460,070	Stk.	Feb. 19	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	85–87	–1½	85¼–87½
600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	62–65	..	63½–64
062,235	,,	,,	4	4	Do. 4 p.c. Con. Pref.	78–80	..	79–80
761,930	,,	Dec. 18	3	3	Do. 3 p.c. Con. Deb.	59–62	..	61⅛–61⅞
130,000	,,	—	10	10	Do. 10 p.c. Bonds	..	..	196½
48,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Mar. 19	6½	6½	Hastings & St. L. 5 p.c. Conv.	92–97	..	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	73–78	..	..
70,000	10	Sept. 25	10	10	Hongkong & China, Ltd.	16–17	..	..
86,600	Stk.	Mar. 5	10	10	Horsley 7 p.c.	138–143	..	..
976,000	,,	Nov. 20	30	10	Imperial Continental Cap.	179–184	..	180–182
263,950	,,	Feb. 5	3½	3½	Do. 3½ p.c. Red. Deb.	71–74	..	..
235,242	,,	Mar. 19	6½	6½	Lea Bridge 5 p.c. Ord.	96–101	..	..
127,340	,,	Feb. 19	5½	5½	Liverpool 5 p.c. Ord.	87–88b	–½	86½–87½
600,000	,,	Mar. 19	7	7	Do. 7 p.c. Red. Pref.	103½–104½b	..	104½–105
165,736	,,	Feb. 19	9	8	Maidstone 5 p.c. Cap.	122–132	..	..
63,480	,,	Dec. 18	3	3	Do. 3 p.c. Deb.	54–59	..	..
75,000	5	Dec. 4	7	5	Malta & Mediterranean	4½–4¾	..	..
541,920	Stk.	Nov. 20	4	4	Montevideo, Ltd.	62–67	..	..
061,315	,,	Mar. 5	5	5	Newcastle & Gateshead Con.	70½–80d	–½	..
300,929	,,	,,	4	4	Do. 4 p.c. Pref.	72¼–73¾d	..	..
529,705	,,	Dec. 18	3½	3½	Do. 3½ p.c. Deb.	68¼–69¼d	..	..
15,000	10	Mar. 5	11	12	North Middlesex 10 p.c.	..	..	..
75,940	10	,,	7 7/16	8⅜	Do. 7 p.c.	..	..	..
300,000	Stk.	Dec. 4	7	9	Oriental, Ltd.	102–107	..	..
188,120	,,	Jan. 8	7¼	7¼	Plymouth & Stonehouse 5 p.c.	109–114	..	..
60,000	50	Mar. 5	13	14	Portsea Island B	96–99	..	..
100,000	50	,,	12	13	Do. C	93–98	..	..
289,909	£	—	—	—	Primitiva Ord.	10/0–11/0	..	10/0–11/0
311,100	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb.	79–81	..	..
600,000	Stk.	Jan. 22	4	4	Do. 4 p.c. Red. Deb. 1911	63–65	..	..
600,335	,,	Dec. 18	4	4	Do. B. Aires 4 p.c. Red. Db.	65–67	..	..
321,670	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	65–67	..	..
150,000	10	Mar. 19	6	6	San Paulo 6 p.c. Pref.	7¼–8¼	..	8¼
125,000	50	Jan. 2	5	5	Do. 5 p.c. Red. Deb.	43–46	..	..
270,000	Stk.	Mar. 19	5¼	5⅝	Sheffield A	102–104c	..	..
419,968	,,	,,	5¼	5⅝	Do. B	102–104c	..	..
047,000	,,	,,	5¼	5⅝	Do. C	102–104c	..	103⅛–103⅜
90,000	10	Oct. 23	8	6	South African	7–9	..	..
609,895	Stk.	Feb 19	5	6¼	South Met. Ord.	94–95	..	94–95¼
895,445	,,	Jan. 8	3	3	Do. 3 p.c. Deb.	59–62	..	61
734,000	,,	Mar. 5	6¼	6¼	Do. 6¼ p.c. Red. Deb.	102½–104¼	..	103⅝
91,500	,,	Mar. 5	8¼	8¼	South Shields Con.	135–136d	..	..
787,795	,,	Feb. 19	6¼	6¼	South Suburban Ord. 5 p.c.	97–102	–1	97–98
368,837	,,	Dec. 18	5	5	Do. 5 p.c. Deb.	97–100	..	..
647,740	,,	Nov. 6	5	5	South'mpt'n Ord. 5 p.c. max.	83–86	..	..
121,275	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	73–77	..	..
250,000	,,	Mar. 5	7	7	Swansea 7 p.c. Red. Pref.	101¾–103¾	–¼	102–103
200,000	,,	Dec. 18	6¼	6¼	Do. 6¼ p.c. Red. Deb.	103–105	..	103¾–104¼
120,000	,,	Feb. 19	8	8	Tottenham District A 5 p.c.	116–119	..	..
882,275	,,	,,	6¼	6¼	Do. B 3½ p.c.	98–101	..	..
181,455	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	75–79	..	..
258,251	,,	Mar. 19	5	5	Tynemouth Con. and New	77–79d	..	..
					Uxbridge, Maidenhead, & Wycombe 5 p.c.	100–105	..	..
197,294	,,	Feb. 19	6¼	6¼	Do. 5 p.c. pref.	95–100	+2	95½
88,330	,,	,,	5	5	Do. 5 p.c. Maidenh'd	90–95	..	..
91,800	,,	,,	—	6¼	Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Mar. 5	9¼	9¼	Wandsworth A 5 p.c.	130–135	..	..
255,636	,,	,,	7¼	7¼	Do. B 3½ p.c.	110–115	..	..
392,955	,,	,,	6/9/6	6/9/6	Do. C and New	95–100	..	97½
352,000	,,	,,	7⅜	7⅜	Wimbledon 5 p.c.	105–110	..	..
98,000	,,	,,	7⅜	7¼	Epsom 5 p.c.	115–120	..	..
88,416	,,	Dec. 18	3	3	3 p.c. Deb.	57–60	..	58

Quotations at :—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. * Ex. div.

Investment stocks benefited from Budget expectations of a decrease in the rate of income-tax. Should some relief be given, the Stock Exchange can hardly fail to derive considerable advantage therefrom. Home Rails were much steadier, although still under the cloud caused by the reduced traffic receipts. In the Industrial Market there was a distinct revival, and several sharp rises occurred.

Transactions in the Gas Market were heavier than usual. Of the quotations, Uxbridge 5 p.c. preference rose 2 points, but the remaining changes were on the downward scale. Gas Light ordinary were again marked down by 1½ points. Several capital issues were announced during the week: North Middlesex Gas Company £16,000 Ordinary Stock at £117 10s. minimum; Littlehampton Gas Company £5000 6 p.c. Redeemable Debenture Stock minimum par; Ashton Gas Company £40,000 5¼ p.c. Perpetual Debenture Stock at par.

The following transactions were recorded during the week:

On Monday, Aldershot 4 p.c. preference 73, Alliance and Dublin 66½ *ex* div., British 112, Commercial 4 p.c. 86½, 87, 3½ p.c. 87, 3 p.c. debenture 58½, European 7, Gas Light and Coke 86¼, 86¼, 86⅜, 87½, 4 p.c. preference 79, 79⅜, 3 p.c. debenture 62, Imperial Continental 182, Primitiva 10s. 1½d., 10s. 3d., 10s. 4½d., 10s. 6d., 10s. 9d., 11s., South Metropolitan 94½, 6½ p.c. debenture 103 5/16, South Suburban 5 p.c. 98. Supplementary prices, Brighton and Hove 6 p.c. "B" preference 106, Dover 5¾ p.c. debenture 102⅜, Gas Light and Coke 10 p.c. bonds 196½, Leatherhead new 4 p.c. debenture 76.

On Tuesday, Alliance and Dublin 67, 67¼ *ex* div., Bombay 5 1/16, British 110, Continental Union 35, European 7, Gas Light and Coke 86, 86⅛, 86⅜, 87, 3 p.c. debenture 61, 61½, Imperial Continental 180, 180½, Primitiva 10s., 10s. 3d., Sheffield "C" 102¼, 102⅜. Supplementary prices, British, Hull, 4 p.c. mortgage debentures 72, 72½.

On Wednesday, Bombay 5 1/16, 5 1/16, Brentford "B" 95, Commercial 4 p.c. 87½, Continental Union 35, 7 p.c. preference 89, 89⅜, Gas Light and Coke 85⅜, 86, 86⅛, 86½, 86⅜, 86⅜, 3½ p.c. maximum 63⅜, 64, 3 p.c. debenture 61⅜, Imperial Continental 180⅜, Primitiva 10s., 10s. 3d., 10s. 4½d., 10s. 5¼d., San Paulo 6 p.c. preference 8¼, South Metropolitan 94½, 95, South Suburban 5 p.c. 97. Supplementary prices, Gas Light and Coke 10 p.c. bonds 196¾.

On Thursday, Bombay 5¼, Brentford "B" 98, Continental Union 35¼, 35⅜, European 7½, Gas Light and Coke 85⅜, 85⅞, 86, 86⅛, 4 p.c. preference 70½, 80, 3 p.c. debenture 60⅜, 61¼, 61⅜, Imperial Continental 180, 181, 181½, Primitiva 10s., 10s. 4½d., 10s. 6d., South Metropolitan 94, 94½, 95, 95¼, South Suburban 5 p.c. 97, 98. Supplementary prices, Brighton and Hove 6 p.c. "B" preference 107¾, Gas Light and Coke 10 p.c. bonds 196½, Liverpool 5 p.c. 86⅞, 87¼.

On Friday, Bombay 5¼, Brentford "B" 95, 96, British 112, Commercial 4 p.c. 86½, 87⅛, 3½ p.c. 86½, Gas Light and Coke 85⅞, 85⅞, 86, 86⅛, 4 p.c. preference 79, 79⅓, 79¼, 3 p.c. debenture 61, 61½, Imperial Continental 180½, Liverpool 7 p.c. preference 104⅜, 105, Primitiva 10s., 10s. 7½d., South Metropolitan 94¼, 94½, 3 p.c. debenture 61, Swansea 7 p.c. preference 102, 103, 6½ p.c. debenture 103⅜, 104⅜, Uxbridge, Maidenhead, 5 p.c. preference 95½, Wandsworth 3 p.c. debenture 58. Supplementary prices, Wandsworth 3½ p.c. new 97½.

Money was scarce in Lombard Street during the week, but towards the close the demand was not particularly keen. Rates remained high, however. Although old day-to-day loans were renewed at 4 p.c., as much as 4½ p.c. had to be paid for new money, but a few balances were obtained at cheaper rates. Again no Treasury Bonds were allotted, and the rate at which the Bills were allotted was £4 4s. 9·66d. p.c., being 7·28d. p.c. above last week's average.

Sterling was the centre of interest on the Foreign Exchange market. The New York rate went to a fresh high level on Friday at 4.81⅛, and the prospects of reaching parity were again revived. French francs closed at 92.52½, Belgian francs at 95.12½, and Italian lire at 117.

Silver was dull, the quotation declining ⅛d. to 31 1/16d. per oz. Gold was 86s. 3d. per oz.

The Bank Rate is 5 p.c., to which it was raised from 4 p.c. on March 5. Bankers' deposit rates are 3 p.c. The deposit rates of the discount houses are 3 p.c. at call and 3⅛ p.c. at notice.

The price of gas has been reduced in Withnell and Brinscall from 4s. 6d. to 4s. 3d. per 1000 c.ft.

The Wakefield Electricity Department are boosting electric cooking by reduced prices of all electricity, but especially for cooking and heating; by the hire of cookers at 7s. 6d. per quarter (for cooker for 4 to 6 persons) and 10s. (for 6 to 10 persons)—the hire charge including delivery and fixing of cooker and switchboard, an electric kettle, and maintenance of the whole apparatus, subject to fair wear and tear. Domestic heating charges are 1d. per unit where a cooker is installed, as against 1¼d. otherwise, and 5d. to 6d. per unit (according to quantity) for lighting.

The Directors of the Oriental Gas Company, Ltd., have resolved to pay, on May 30, an interim dividend at the usual rate of 3½ p.ct., less income-tax, on account of the year ending on June 30 next.

At Blackpool, on April 23, Mr. J. H. Chew, Gas Engineer and Manager, reported that during the year ended March 31 ten miles of gas mains were laid and 1689 new consumers connected, compared with 5½ miles of mains and 1084 consumers for the previous year. The Easter output was just under 20,000,000 c.ft.—an increase of 2½ million c.ft., or 14½ p.ct. During the five weeks ended April 25 the output was 85⅝ million c.ft.—an increase of 6⅜ p.ct. During the month 150 new consumers were connected, against 95 a year ago.

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EDITORIAL NOTES.

The Budget and Industry.

SINCE the Chancellor of the Exchequer (Mr. Winston Churchill) made his famous speech last Tuesday week outlining his fiscal proposals, they have been the primary subject of consideration and discussion throughout the country. The immediate effect of the revelation of a clever piece of financial construction was gratification and applause. But in a few hours the country had been led into a new channel of thought; and it was then seen that, so far as those large sections of industry and commercial enterprise which give considerable employment are concerned, what the Chancellor gave away with one hand he, at any rate in part, withdrew by the other. In short, there is comparatively little in the Budget which will assist, encourage, and inspire industry. Industry and trade would have been better pleased with the sixpenny reduction from the standard rate of income-tax had there been nothing to discount it. The individual payer of income-tax who has to pay only on earned income, or on interest and dividends which are derived from investment sources which will not have their profits materially affected by an extension of burdens in other directions, will heartily welcome the relief. This applies to a considerable number of workers in the gas industry. The increase in the relief, too, to earned incomes from one-tenth to one-sixth, with the maximum deduction raised from £200 to £250, is satisfactory; and the treatment of investment income as earned income of taxpayers 65 years old or more (with incomes not exceeding £500) is also a step in the right direction, as many relatively small recipients of investment income find the standard tax at such rates as are now ruling a burden and deprivation which does not conduce to the happiness of their old age. Those fortunate ones who will get relief in respect of super-tax are also thankful. The new scale of death duties will bring an additional revenue to the exchequer. But, taking together the relief to super-tax payers and the increase in the death duties, the transfer of tax from income to capital is, of course, unsound in principle. The return of the McKenna duties has given satisfaction in those industries which will gain from the protection; but there has been a big outcry against the increase of duty on silk and artificial silk. The unhappiness that has been created by this in the trade, and especially among the fair sex, has led to the expectation that there will be modification in this regard. Imperial preference is welcomed by most people other than the Labour Party. Views as to the restoration at the present time of the gold standard are mixed in view of the serious industrial and trade depression and the ruling heavy taxation. There are those who believe this will impose a further strain upon industry; but the apprehensions of many should have been allayed by the debate in the House last Monday.

But it is the big extension of the Health Insurance Scheme on a contributory basis, with provision for pensions for the widows of insured men, and allowances for children up to the age of 14, which has raised the greatest controversy. From Jan. 6, 1928, all contributors, male or female, over 65 years of age will receive 10s. per week irrespective of means test or inquisitions. For this scheme, in addition to the present health insurance contributions, the employer has to pay an additional 4d. a week for every man, and the man an equal sum; while the respective contributions for every woman will be 2d. In these times of depression and heavy taxation, this is a new burden of a magnitude which will be especially onerous to those industries and businesses the nature of the operations of which calls for a considerable number of workers; and it is these very industries which require their burdens lightened in these days of rampant unemployment. With the principle and objects of this extension of universal insurance among workers, no one will disagree; but a more inopportune time for its launching could not have been found. The gas industry has been forced into increasing the price of gas owing to the bad conditions ruling in the markets for their secondary products, and certainly will not be pleased—more especially bearing in mind what is already done for the workers—at having to face just now an additional obligation in this direction. As Sir Robert Horne has pointed out, industry at the moment has already to find 36 million pounds for unemployment insurance and 26 millions for health insurance; and the new imposition will mean anything between an additional 14 and 20 millions. The Chancellor has some hazy notion that there will be a large adjustment by the weeding-out of the undeserving from the deserving in the case of unemployment, and so lightening the payments in that respect. The Government are determined to deprive of the "dole" those who are better satisfied with it than with work. But that is, in the present state of industry and unemployment, a vague form of partial compensation to have in view. There is unquestionably a hardening of opinion in the direction of insisting that the Chancellor shall find some method of relieving the burden of contributions by an amelioration of conditions in some other direction. It is understood that the matter is being very seriously explored by the Treasury in view of the strength of the representations that have been made and the probable opposition—not perhaps for all time, but now. It is understood that the influential Industrial Group in Parliament will bring their weight to bear upon the matter. The Labour Party, too, do not like the contributory part of the scheme—so far as the workers go—and they consider the benefits proposed are not proportionate to the extra contributions and the increased cost.

The Budget, however, is essentially one which will give satisfaction or otherwise just as it affects personal interests. The country has been called upon to bear unprecedented burdens during the last decade. It is suffering from them now; and relief to the fullest possible measure, without new burdens, is necessary to supplement the expenditure of effort to bring about the prosperity which alone can give us industrial peace and general contentment.

Gasholder Tank Troubles in Mining Areas.

From time to time gas engineers hear and read of the difficulties that are experienced by their colleagues who are in charge of gas works and distribution systems in districts undermined by colliery workings. As they read or hear, they sympathize, and then perhaps forget all about the matter until, for example, a Commission sit to inquire into, and report upon, the effects on property, including gas plant, in areas honeycombed by the removal of the subterranean wealth. But those engineers who are immune from troubles due to this cause will unstintedly congratulate themselves upon the fact after they have read the paper on "Experiences with Gasholder Tanks in a Mining Area" which Mr. Charles Dru Drury read before the North of England Gas Managers' Association at their meeting last Friday. The contribution should be presented to the members of the Commission on Subsidences in Mining Areas. They would see how jeopardized is the property of public utility concerns so situated, and therefore the supply to the public of a commodity which has become an essential in almost every household and industry. The winning of coal must go on even though on the surface there are buildings and plant. Something, however, should certainly be done to give more protection than is the case at the present time; and if and when such workings are going to be carried under heavy surface plant, the opportunity should be afforded to take any protective measures that may commend themselves. But reading Mr. Drury's paper, we see that, in several of the cases described of serious difficulty with holder tanks, the first intimation that the colliery workings were causing dangerous conditions which would threaten the plant was supplied by houses and other premises in the neighbourhood developing cracks. A gasholder tank, with its dead weight of structural material and water, is not a light thing; and that its soundness should be maintained is important on account not only of its initial cost, but also of the heavy expenditure entailed in rectifying faults developed by outside influences. The detection of those faults is sometimes difficult and money and time absorbing, as is the determination of the full remedial measures. Moreover, while thrown out of service, to the extent of the storage involved, the capacity of the undertaking is weakened for satisfactorily serving the public.

We do not think any engineer would wittingly construct a gasholder and tank upon a site which he believed would before long be undermined by colliery workings. The point is noticed in Mr. Drury's paper that, in most of the instances of tank trouble which he mentions, the holder tanks had continued true and stable over a good course of years before there was any unusual sign of trouble, which indicates that, when their sites were originally chosen, there was no anticipation of these events—not even an idea as to their distant possibility. A trouble is that even the best engineering knowledge and skill cannot construct a gasholder tank of which it could be confidently asserted that it would be free from injury as the result of the assaults of colliery operations. Mr. Drury's paper shows that in his professional practice he has had to deal with tanks that had dropped out of level, and developed fractures to such a degree that the water flowed away at an alarming rate, and rendered the holders useless for service, until remedial measures—sometimes of a vast order, and demanding skill, perseverance, and patience in exploration and application—set matters right, only to be followed by long watchfulness to ascertain whether the success could be relied upon as being more or less permanent. Without reward one may search the paper from beginning to end for some light as to the type of tank which experience has declared to be the best capable of resistance to the dire effects of such subsidences; but there is the cold declaration that "none is wholly proof against the effects of subsidence, should it occur," and "even the tankless holder in like circumstances would not be immune from trouble." There is one thing certain, that if serious trouble does develop through subsidence by colliery workings, an inexperienced engineer in such matters should immediately call in an experienced one; for as the paper is read, and the different examples of tank trouble through subsidence are studied from first discovery to the remedial operations and their results, it is plain that the exploration that has to be made, the decisions that have to be arrived at, the steps that have to be taken to secure soundness and stability are not of the ordinary work of a gas engineer, and in such cases experience and resourcefulness count for much. There are hardly two cases in which the structural defects arising from subterranean disturbances were the same, and where the corrective operations were of like order. It is manifest that each case has to be considered and dealt with independently—sometimes drastically, but always with a skill and ability which allow nothing to escape which may again menace the soundness of the fabric of the tank. It may not always be possible, as in the last example quoted by Mr. Drury, to complete the elimination of the defects or the causes of the defects at the first attempt; and this is a greater reason why, in carrying out such operations, an engineer with experience of underground disturbances and tank disablements should be called in either to take the whole matter in hand, or to act in an advisory and supervisory capacity. In the end, by this course, there is little question that, in most cases, money and time will be saved, and the holder restored to normal working at the earliest possible date.

In the paper—high in quality and engineering value—Mr. Drury gives an account of how the misfortunes arose to the holder tanks which are used as examples, the nature of the explorations made to ascertain the causes, and details as to the expedients to which there had to be resort to realize success. The effectiveness of the work in each case is shown by continued tank tightness over the period which has elapsed since the work was carried out. In other words, time attests the efficacy of what was done. Descriptive details of the kind do not give much scope for comment; they are for reading, study, and guidance. All that is required is cordially to thank Mr. Drury for a paper that is novel and even fascinating; for among the things of which an engineer likes to hear is a tough job environed with difficulties, which have been made to succumb to the treatment prescribed, after careful diagnosis, by a fellow practitioner.

Smokeless Heating and Coal Conservation.

The District Conference of the "B.C.G.A." which was held at Chester last week was one of those delightful occasions which—through the surroundings, the generous hospitality, and matter for discussion of a high standard—are long retained in memory. To the Chairman of the Gas Company (Sir John M. Frost), his fellow-Directors, and the Secretary and General Manager (Mr. F. A. Pye), hearty acknowledgments were due and were given for putting upon the day's arrangements just those touches of welcome, entertainment, and direction which make for maximum success. These district conferences are something more than meetings at which subjects of interest to those engaged in the industry are discussed. The proceedings are intended to reach the outer world, and to interest in gas affairs the public in a large surrounding area; and this aim is always accomplished. On this occasion, the dominant subject under consideration was the position occupied by the gas industry in relation to coal conservation, the reduction of smoke pollution, and labour saving; and that position—taking those items separately or combined—was shown to be pre-eminent among the heating agents. Electricity is offered at 1d. per unit for heating purposes; sometimes a higher average price is, through the two-part tariff system, secreted in a lump-sum payment. But the penny is a reflection of the difficulty in meeting competition; and the industry also callously ignores the waste of our chief national asset in the production of electrical energy for heating.

To the consumer and to the nation, the use of electricity for domestic heating is an uneconomy of no small order. That is a point electrical men attempt to hide; and the Government appear to be too busy with other matters to give attention to it. Yet it is an outstanding national matter in view of the nearly 40 million tons of coal consumed to-day in the households of the country, to say nothing of the many more millions used in industry, and in view, too, of the insanitary conditions of the atmosphere and the appalling waste of health, money, property, and human energy which is brought about by the burning of

raw coal. Taking together the domestic and industrial requirements for heat in the country, they far transcend the demand for power; and yet the Government proceed as though power and nothing else is the necessity to which thought should be given. With power is combined the question of heat for its production; and therefore fundamental to it all is the most economical method of producing that heat in the national interests—and the national interests are those of the country's industries. It is well known that an inclination in Government policy is to finance electrical development without consideration of those radical questions to which attention is drawn here. Sir John Frost made this point, in other words, when he said that the gas industry in this country had developed to the highest efficiency without State aid, and so had all the other foundation industries of the country. The electrical industry does not seem at all abashed over the fact, or in any way averse to accepting State aid to secure development at other people's expense, although the country is overburdened with taxation to-day. The injustice to other industries of preferential treatment in this respect does not in the slightest degree disturb its conscience; and yet it can be proved beyond contradiction that the utilization of coal for generating electrical energy for heating purposes is a distinctly uneconomic proceeding. The speech of Sir John Frost, and the paper by Mr. Owen Evans on "National Economy in the Use of Coal," brought these matters definitely to notice and to narrow compass; and Dr. Harold Hartley showed how gas has ameliorated the conditions of labour in the home and assisted in the purification of the atmosphere, and this by indisputably the most economical smokeless agent extant.

In one of the discussions, a novel suggestion was made by Mr. J. H. Crowther. It was that municipalities, instead of looking to their gas undertakings to contribute something in aid of the rates, should make a contribution to gas undertakings to enable them to sell gas at a nominal price. What was lost in one way would, Mr. Crowther said, be gained in another—in the health of the community. The idea of helping to make gas cheap as being part of the highest service local authorities can render to their communities has probably never occurred to any of our urban governing bodies. We should like to see the point discussed by them from the standpoint of local advantage, or disadvantage—if any can be found. The question of whether or not legislative authority would have to be obtained for such an innovation could be left until the question of advantage or otherwise had been determined. Our view is that any disadvantage that might be advanced would be easily overwhelmed by the advantages. However, the proceedings at the Chester District Conference are studded throughout with good points worthy of being remembered, and for production and use in our daily work as occasion requires.

Doctors, Coroners, and Carbon Monoxide.

IT is a curious thing how some doctors and coroners—fortunately not many—appear prepared nowadays always to attribute to carbon monoxide poisoning the death of a person when it occurs in a room in which gas is being used. At one time in the case of bathrooms—unventilated, and in which geysers had been fixed without a flue-pipe (to which practice the gas industry is strongly opposed)—deaths that occurred on rare occasions were ascribed to suffocation by carbon dioxide. There was more truth in that than in the carbon monoxide theory; and some of the cases asserted to have been due to suffocation may have been attributable in part to organic disorders in the victim. We do not deny that, when a geyser is first lighted and the flames come in contact with cold surfaces, carbon monoxide may be generated. But this is only temporary; and if the geyser has a vent-pipe to the open air, there is no more liability to trouble in a bathroom than if a coal fire were used. As a matter of fact, the average carbon monoxide content of the waste products passing up a chimney from a coal fire will be a larger percentage than that flowing away temporarily by the vent-pipe from a geyser. It seems to us that some of our medical practitioners and coroners require to have their attention expressly brought to the elementary facts regarding the combustion of gases and the waste products from that combustion in different circumstances.

It has been noticed on several occasions that death has been attributed to carbon monoxide poisoning when the published facts do not by any means support the statement. There was the case only a few weeks ago of a house parlourmaid at Chelsea, who was found dead in a bath. A geyser was used in the bathroom; and it was stated by a doctor that death was due to carbon monoxide poisoning. When the young woman was found in the bath, the geyser was still burning. Now that geyser had probably been in use for some time before the sad event; and we have seen no evidence to the effect that there had previously been any trouble with, or complaint regarding, it, nor had anybody suffered any harmful consequences through its use. Indeed, the geyser has since been carefully examined by an inspector of the Gas Company; and it was found to be in good working condition. In fact, there was nothing wrong with it. That being so, where could the carbon monoxide have come from to which the doctor attributed death? The Coroner (Mr. H. R. Oswald) confessed that the case was a puzzling one; and he stated that he has a geyser in his own house, but always opens the window of the bathroom some time before having a bath. That is quite a sensible thing to do. Bathrooms, whether or not there is a geyser in them, should be adequately ventilated the same as other rooms; but unfortunately there is usually very little attention to that condition. The geyser naturally requires a supply of air; but as long as the flames are burning properly, the necessary quantity of air for that purpose and for human existence will be satisfactory. The fact that the heated products are flowing up a vent-tube will induce better ventilation than would otherwise be the case in a closed bathroom without the geyser and without any means of ventilation.

It is true that, in the case alluded to, a verdict of "Accidental Death" was returned; but we are rather afraid that the Coroner is not altogether satisfied as to the absence of carbon monoxide from the bathroom. Among other things, he said the case reminded him of one he investigated "some time ago," when a man was found dead in front of a lighted gas-fire. That is interesting from the fact that, although there are to-day millions of gas-heated appliances in use in this country, it is "some time ago" since that case occurred. Furthermore, the death of a man sitting before a gas-fire or any other fire, is not evidence that the fire was the cause. Bearing upon the observation by the Coroner, he may be interested in the experiments of Dr. Leonard Hill, F.R.S., on the question of the safety of gas-fires in regard to carbon monoxide. The results of the researches were published in the "JOURNAL" for April 8 (p. 110).

Gas Workers' Wages.

The Labour Correspondent of "The Times," who is probably in close touch with the Unions identified with the gas industry, reports that negotiations on the wage proposals have been resumed in the gas industry. The annual meeting of the Joint Industrial Council for the industry provided an opportunity for the employers' and the workmen's representatives to come together; and the danger of the disbandment of the Council has been averted for the present by the resumption of discussions on the wage claims. But the fear of unfortunate consequences has not yet been removed. Before the meeting, the two sides of the Council met separately—Mr. D. Milne Watson presiding over the employers' section, and Mr. Will Thorne, M.P., over the trade union section. The Council met later; and the annual report and the financial statement were adopted. Before taking other business, the Council considered the wage proposals. Agreement was not found possible; and after a lengthy sitting the meeting was adjourned for six weeks.

Coke Sales by Analysis.

A development which will be noted by those who are preparing papers for the coke competition (see "JOURNAL" for Feb. 18) is the sale of coke by analysis. The idea is more or less in the initial stages; but it is in practice in the West Cumberland and one or two other areas in connection with metallurgical coke. It seems, however, that the scheme is

being pushed by buyers rather than by the producers; and that is not surprising. The development has been the subject of an editorial article in "The Engineer." Explaining it, our contemporary says: "The new scheme is that coke shall be sold on a 10 p.ct. ash basis, and that, if the ash should be 11 p.ct., a reduction of (let us say) 6d. per ton as being not far from the mark should be made in the price. Conversely, if the ash should turn out to be 8 p.ct., the buyer would have to pay a further 1s. per ton. What the arrangements are, if any, as regards water, sulphur, or other components of the coke, we do not know. A difference of 1 p.ct. of ash in the coke is thus seen to be equivalent to £25 on 1000 tons—a matter which in these strenuous times may be considered of importance." One reason for opposition to the plan is given by the producers' association in an important district. It is the difficulty that is to be apprehended in respect of correct sampling. Ash in coke is not evenly distributed—in fact, a large piece may show wide variations of ash content in different parts. This indicates that sampling would have to be carried out on a considerable quantity of material and by a trained sampler, if disputes are to be avoided. Our contemporary, assuming absence of disagreement over the sampling, says the new scheme appears to be a desirable development.

Tar and Bitumen.

That very active work is in progress in opposition to the use of tar dressing on roads in proximity to fishing waters, with strong and influential advocacy of bitumen, is seen from a report which is reviewed in later columns. The matter is being attacked not only from a biological standpoint but from that of the chemical purity of rivers. The exploration is to be largely developed in the scientific direction.

The Factory Bill.

In our "Electricity Supply Memoranda" reference is made to the Factory Bill, and to matters associated with it that are of importance to the gas industry. Although the provisions of the Bill are not yet available for examination, sufficient is known regarding it to justify the remark that the representatives of the industry will have to keep very careful watch over the measure to see that its interests are not detrimentally affected. Two or three weeks ago, the Government were of opinion that the Bill might be passed through Parliament this session. But the political situation and outlook undergoes rapid transformation these days; and it is now stated that, though the Bill will probably be formally introduced this session, it is not likely that progress will be made with it before the session of 1926.

Aldershot and the Capital Issues Act, 1920.

More than ordinary interest attaches to the Aldershot Gas, Water, and District Lighting Company's application to the Board of Trade for a Special Order. It intends to confer further capital and borrowing powers, and contains a proposal which has relation to the doubts that have recently existed as to whether unexercised authority obtained under the Public Utility Companies (Capital Issues) Act, 1920, can be utilized after the expiration of the Act on the 20th inst. The Act gave the power, with the assent of the Board of Trade, to issue debenture stock or borrow to the extent of one-half of the share capital for the time being issued and paid up. In the "Journal" for April 8 (p. 107), reference was made to Counsel's opinion obtained by the National Gas Council, as to whether unexercised powers would be valid after the 20th inst.; and it will be remembered that the opinion was distinctly opposed to the hypothesis that they could be. The Aldershot Company have, as the Chairman (Mr. R. W. Edwards) pointed out in a speech to the shareholders last Thursday, accepted the view of Counsel, and so are going to ask the Board of Trade, by Special Order, to make a one-half proportion the permanent relation between the Company's borrowing powers and share capital. So far as memory serves, Mr. Edwards is right in saying that he believes the Aldershot Company is the first to adopt Special Order procedure for this particular purpose. There is no reason why the one-half proportion should not be made permanent in view of its advantage, and the fact that there is precedent for it in Acts of Parliament. If the Order succeeds in this respect, it will constitute a precedent for obtaining an extension of loan capital powers without the delay and expense entailed in seeking authority direct from Parliament.

A Promise for Wembley.

Summer months during which there is a plethora of rain rob us of much opportunity and pleasure. The Duke of York (who this year is President of the British Empire Exhibition) is of opinion that the weather last year robbed the exhibition of many millions of visitors. At a luncheon the other day he expressed the hope that those millions and many more would be attracted to Wembley this year. He believes that, if the weather is not again unkind, the millions desired will pass through the turnstiles. He promises that the Exhibition will be as complete and impressive a picture of our great heritage of Empire as was seen in 1924; but it will be a new picture—a picture seen from a different angle, a picture showing fresh aspects of our Imperial life. The exhibition will follow faithfully those modern methods of education which insist that, before all things, a lesson must be bright and interesting. As His Royal Highness says, "it is incumbent on all of us to do our utmost to make the 1925 season a brilliant success."

Coke and Power Alcohol.

The "Petroleum Times" reviews an article by Mr. Herbert Langwell, which has appeared in the "Industrial Chemist," and in which is discussed the question of the production of power alcohol. This gentleman takes the line (as has previously been done) that material suitable for food cannot be economically utilized for power purposes. In view of this, the production of synthetic alcohol requires consideration. He refers to two processes which have been investigated; but it does not appear that with them commercial success has yet been achieved. These systems may be described as the "carbide-alcohol" process and the "water gas-methyl alcohol process." In both coke would be used—if successful; and in that event the gas industry would welcome them. The first consists in converting coke and limestone into carbide of calcium for acetylene production. The acetylene may be converted into alcohol *via* ethylene and ethyl sulphuric acid, or *via* acetaldehyde. The conversion of acetylene into ethylene, although a simple laboratory process, is not easy on a large scale; but the technical difficulties in converting acetylene into acetaldehyde appear to have been overcome by a Swiss firm, who, however, have not yet made the process commercially successful. The water gas-methyl alcohol process is quite a modern one; but this also has not yet reached a commercial stage. It depends upon a catalytic reaction by which carbon monoxide and hydrogen are made to combine to form methyl alcohol. The large employment of water gas for this purpose would involve a considerable consumption of coke. However, Mr. Langwell thinks that the most promising source of alcohol is cellulose. The "Petroleum Times" (with an eye upon the interests of the industry it serves) says that, in discussing the production of alcohol *via* ethylene and ethyl sulphuric acid, Mr. Langwell is either not aware, or has overlooked the fact, that gases of the ethylene series are being produced in very large quantities in petroleum cracking processes, providing a practically ready-made material for the production of ethyl and other alcohols.

Iron and Steel Industry.

The number of furnaces in blast is always a reliable index as to the conditions ruling in the iron and steel industry, and the prevailing conditions are anything but good. At the end of March there were 169 furnaces in blast; in the December quarter, 171; in the September quarter, 176; in the June quarter, 196; and at the end of March last year, 208. A difference of 39 is a big one on such a number in twelve months; and the figures show that the fall has been of a gradual order.

Gas Companies and Electricity Orders.

The Statutory Gas Companies (Electricity Supply Powers) Bill went through Committee yesterday morning. We congratulate the promoters. It will be a useful supplement to the enactments applying to statutory gas companies, as it will

(when it receives the Royal Assent) authorize them to apply for Special Orders under the Electricity (Supply) Acts, 1882 to 1922, and to use their funds in the promotion of such applications. It also invests the Electricity Commissioners with authority to empower—subject, after consultation with the Board of Trade, to such limitations and provisions (including the keeping of separate accounts) as they see fit to impose or insert—any statutory company to apply their funds to, and to raise capital or borrow money from time to time for, electricity purposes.

NATIONAL GAS COUNCIL.

District Executive Board Meeting.

SOUTH-WESTERN AREA.

The Annual Meeting was held at the offices of the Exeter Gas Light and Coke Company on April 30—Mr. G. Hardy Harris (Exeter) in the chair.

The minutes of the last annual meeting, dated May 15, 1924, were read and confirmed.

The Chairman read, and moved the adoption of, the report of the Management Committee for the year ended March 31, 1925. Mr. P. S. Hoyte seconded, and the report was adopted.

The list of elected members for the District was received.

Mr. P. S. Hoyte proposed, and Mr. S. J. Ingram seconded, that Mr. G. Hardy Harris be re-elected Chairman of the District Executive Board for the ensuing year. The resolution was carried unanimously. On the motion of Mr. G. Hardy Harris, seconded by Mr. W. P. Tervet, Mr. P. S. Hoyte (Plymouth) was unanimously re-elected Vice-Chairman.

The following twelve members were elected on the Management Committee: Messrs. J. Armstrong (Ilfracombe), R. Bruford (Taunton), J. H. Cornish (Bridgwater), C. G. Dawson (Torquay and Paignton), W. E. Dean (Exmouth), S. E. Hallwell (Bristol), S. J. Ingram (Truro), J. E. Norman (Weston-super-Mare), W. P. Tervet (Plymouth Corporation), W. N. Westlake (Exeter), J. W. Whimster (Bath), and T. H. Woodcock (Stroud).

Mr. G. Hardy Harris proposed, and Mr. T. H. Woodcock seconded, that Mr. S. J. Ingram (Truro), who retires in rotation, and is eligible for re-election, be re-elected one of the representatives on the Central Executive Board. This was carried unanimously.

On the motion of the Chairman, seconded by Mr. C. G. Dawson, it was unanimously resolved that Mr. E. H. Dart be re-elected Hon. Secretary for the ensuing year.

"House Heating."—This book, written by Dr. Margaret Fishenden, and published by H. F. & G. Witherby (price 25s. net), is a general discussion on the relative merits of coal, coke, gas, electricity, &c., as alternative means of providing for domestic heating, cooking, and hot water requirements.

"Metalworkers' Practical Calculator."—This book, which has just been published by Sir Isaac Pitman and Sons, Ltd. (price 2s. net), is intended primarily for the man in the workshop and the private student. For this reason the examples have been stated as simply as possible, even to the extent of ignoring convention. The working-out of the examples has been shown in detail, for instructional purposes. The book has been written by Mr. J. Matheson, author of "Intelligence Training" and "Practical Applied Grammar."

National Benzole Company's New Installation.—An illustrated description appears in "The Petroleum Times" of the new plant in Liverpool of the National Benzole Company, Ltd. This installation, at Dingle Point, has been designed for receiving ocean tankers and storing and delivering both benzole and petrol; and it has a storage capacity of approximately 12,000 tons. The management estimate that the new depôt will enable the handling of 200,000 gallons of "National" benzole mixture per month by road. The storage facilities have been constructed by Messrs. Newton, Chambers, & Co., Ltd., of Sheffield, and consist of three tanks, each of 3000 tons capacity, and two tanks of 1500 tons each.

Southern Association Visit to Bournemouth.—Arrangements have now been completed for the visit to Bournemouth on June 5 of the Southern Association of Gas Engineers and Managers. Members will assemble at 10 a.m., in the Square, Bournemouth, where motor coaches will be in attendance to convey them to Pitwines and Poole Gas-Works. At 12.30 the party will return to the Branksome Towers Hotel, where they will be the guests at luncheon of the Chairman and Directors of the Bournemouth Gas and Water Company. After luncheon the visitors will leave by motor coach, *via* Kingston, for Swanage, where tea will be provided at the Grosvenor Hotel. The return journey will be made *via* Rempstone and Corfe Castle, arriving at Bournemouth Square at 6 p.m.

PERSONAL.

On leaving to take up the post of Distribution Superintendent to the Macclesfield Corporation gas undertaking, Mr. F. C. RANDALL, District Inspector of the Exeter Gas Company, was presented by his colleagues with a gold albert, and by the fittings staff with an attaché case.

Upon relinquishing his position as Manager to the Launceston Gas Company, in order to take up an appointment in Guernsey, Mr. R. G. LUXON was presented by the employees with a silver cigarette case. He is succeeded in the managership by Mr. J. W. GIBSON, of Swanage.

ELECTRICITY SUPPLY MEMORANDA.

The Investigation.

It is understood that probably another fortnight will have to elapse before Lord Weir's Committee will be able to present to the Minister of Transport their report on the development of electricity supply in this country. We shall be rather curious to see the issue of this, because, knowing the thoroughness of Lord Weir in all matters appertaining to engineering, as well as his interest in the question of the conservation of coal and the co-ordination of the utilization of our fuel supplies, we are hoping that the report will not be of the one-sided and barren character of other reports on the same subject—through electrical obsession and a preponderance of electrical opinion on the Committees who have previously dealt with the matter. Through this there has been no genuine exploration beyond the electrical boundaries to ascertain whether the national interests can best be served by breaking through them, and opening up fresh technical procedure. It was thought at one time the Government would be able this session to produce a scheme to increase electricity availability; but it is no use half doing a piece of work of this character. Lord Weir's Committee have found that the subject was so extensive that more time than was anticipated was necessary for investigation, consideration, deduction, and final presentment of views and recommendations. After this there will have to be a large amount of work at the Ministry of Transport before the proposals can be matured and put into form for submission to Parliament. At the recent dinner of the Institution of Electrical Engineers, Col. W. Ashley emphatically stated that the Ministry of Transport would not lay any scheme before the Government until it has been thoroughly examined, and the propositions have received the most ample consideration. It would appear from this that light has already been creeping into hitherto dark places from which emanated, with fine agility, fanciful predictions as to what the Government were prepared to do. If properly sized, it is a big complex problem, and no part of it should be left unexplored. Then something with completeness and finish should result, and something which takes a broad and long view of national interests. Fuel, power, and heat all have part in the problem, and so have the economic interests of the nation. The question now is, Have Lord Weir's Committee risen to their opportunities?

Preferential Legislation.

If the Factory Bill which the Government propose to introduce contains provisions which savour of grandmotherly interference with industry or impose any unnecessary burdens upon it, there will be such an outcry that even the Government will be made to feel that influential people in the country will not tolerate political tyranny even from their own party. There have been leakages as to the contents of the Factory Bill which is being trimmed and shaped for introduction to Parliament, and prominent manufacturers are already looking upon the measure with suspicion. So much so is this the case that the National Union of Manufacturers have already had an interview with the Home Secretary, at which representations were made as to ample time being allowed for the consideration of the provisions of the Bill, and regarding the need for avoiding further burdens at the present time upon industry in its depressed state. At the interview, strong exception was taken to various features in the Bill introduced by the late Labour-Socialist Government—more especially in respect of limitation of the hours of work and the powers of the Home Secretary and inspectors concerning cubical capacity, heating, lighting, ventilation, cleaning, &c. There is good ground for that—in regard to lighting especially. Every industry and every process requires different illumination treatment; and it would be a disastrous thing if lighting requirements were left to a dictatorial inspector, who has not the technical knowledge of illumination need for different classes of work, &c. We should not like it to be thought that our opinion is that all factory inspectors are dictatorial; but there is inclination to the view that lighting science and practical requirements, with one exception, are not within their compass. The exception is adequate general lighting, particularly at dangerous points, and this any man should be competent to

judge. The Home Secretary asserts that it is his earnest desire that the measure should be beneficial to both employer and employed, and not prove a burden to the manufacturing community of the country. If that is so, then perhaps he will see to it that unnecessary expenditure in regard to lighting is not imposed upon the factory owner by any insistence on the conversion from gas to electric lighting. We frankly admit that the gas lighting of many factories sadly wants improving; and modern economical and highly efficient gas-lighting methods offer the scope for it, without the expense of changing from one system to another. In every possible way, those who are in a position to pull political strings for the electrical industry are doing so. There is the Offices Regulation Bill, which proposes to enact that every office must be adequately ventilated and lighted both by day and night. Similar provisions appear in the Factories Bill introduced by the Home Office during the reign of the last Government. It has been found that it was the intention of the Home Office to become invested with the power to interfere with the liberty of the subject by ordering the owner and occupier of any office to substitute electricity or some other method of heating or lighting, in lieu of gas, where they thought fit. Steps, we believe, have been taken to frustrate this absurd design, the very suggestion of which shows positively that ill advice sometimes rules in high quarters simply because the necessary knowledge is not there available to arrive at a proper determination. However, so far as the Factory Bill goes, there will now be plenty of opportunity to discuss the provisions, as, though a week or two ago it was hoped that the Bill would receive consideration from Parliament this session, it is now found that the session is already overweighted with work, and therefore, though the Bill may be formally introduced in a few weeks, it is not likely it will be seriously handled before the session of 1926.

"E.D.A." and Wembley—Last Year.

The annual meeting and luncheon of the Electrical Development Association have been held. The after-luncheon speeches contained many nice things as to the work of the Association, and an appeal for greater co-operation. One of the speakers stated that during the past five years work has been proceeding to convert the industry, and now the next step is to get the members of the Association to convert the public, with the aid of the Press. That is a very limited aspect to take of the past work of the Association; and as to the future our interest is aroused in the conversion scheme, as it has, of course, something to do with the current utilization of gas. There has been strenuous work during the past few years to convert the public, with enormous difficulties interposed which are inseparable from electricity supply, and which the electricity industry feels more and more. Wembley, it is stated, was only a beginning; and funds are now being raised to educate the public in modern electrical methods. Some of the electrical papers are disappointed with the speeches made at the luncheon. With members of the daily Press there, they are of opinion that a grand opportunity was lost. However, about Wembley last year, it is stated that support was received from 152 municipal undertakings, 89 companies, 19 power companies, and others; and the funds collected amounted to £24,440. Assistance was also received from the "B.E.A.M.A.," the "E.L.M.A.," the "C.M.A.," and the "E.C.A." by way of loans of material and labour, having a cash value of probably £2000. An expenditure of £5039 was also incurred on advertising—the total outlay on the effort being £33,373. It is estimated that a million persons passed through the exhibit, 400,000 conversed with the staff, and 10,000 inquiries were dealt with. The exhibition was open about 156 days, so that the 400,000 conversations equal about 2600 a day and, reckoning ten hours a day, an average of 260 conversations an hour. That is smart work; but brevity is the soul of wit. There are several humorous points about the application of electricity to domestic purposes. Had the public been told of them at Wembley, we should have seen more merriment and activity round about the "Electricity in Service" display last year.

Other Work.

The report on the year's work states that the membership at Dec. 31 last included: 101 municipal supply undertakings, 13 London companies, 11 power companies, and 62 provincial companies; manufacturers 243, contractors 830, and wholesalers 66—total 1326. The supply membership represented 75 p.ct. of the total output of the country. The subscription revenue was derived as to 55 p.ct. from supply undertakings, 40·5 p.ct. from manufacturers, and 4·5 p.ct. from contractors and wholesalers—the total being £10,654. During the year, Sub-Committees were engaged upon the study of domestic electrification, standardization, reform in tariffs, local exhibitions, agriculture, wiring rules, &c. Press advertising was carried on, especially in connection with the British Empire Exhibition and late shop-lighting. A large amount of publicity was also obtained for the electrical industry through the editorial columns of the Press. Over three million items of publicity matter were purchased from the Association, besides which very large quantities of such matter were distributed by the Association at the British Empire Exhibition. Several kinema films were added to the stock, bringing the total up to ten films, which were in constant demand. Lectures were also delivered by the staff and by helpers, and the lantern slides and lecture notes were in continuous demand. Short talks on electrical subjects were given to students of both sexes in schools. Salesmanship conferences were held, for the fourth season, leading to increased enthusiasm and a demand for reprints of papers. Assistance was given to the Women's Electrical Association and other bodies, and arrangements were made for a very effective display of "Modern Lighting Service" by the "E.L.M.A." Joint Lighting Service Bureau at the "I.M.E.A." convention. During the International Advertising Convention, papers were read in the Public Utility Section by members of the Association; and in connection with the Coal Smoke Abatement Society's Exhibition an "All-Electric House" exhibit was organized, which was visited by 41,000 persons. Numerous reports on matters relating to the commercial development of electricity supply were circulated to all the electrical undertakings in the country. Congratulations to the Association on the expansion of its activities.

Per Capita Data.

Sir Philip Nash, speaking at the annual meeting of the Metropolitan-Vickers Electrical Company, Ltd., made comparisons of how this country stands in respect of the output of electricity per head of the population. He finds that we are in a relatively sad position, if Italy and Germany are excepted. The figures are as follows:

	KW.H.		KW.H.
Great Britain	133	Germany	120
U.S.A.	450	Italy	103
Switzerland	682	Norway	1850
Canada	765	Belgium	230
Sweden	475		

The figures are arrived at by taking the total production of electrical energy in each country, and dividing it by the population to show the output per head. The figures are for 1922, so that the last two years may have made a considerable difference to the position of this country compared with others. As a matter of fact, although complete statistics for all the countries are not yet available for subsequent years, it is known that in 1923 the British figure had risen to 155, that of Italy to 129, U.S.A. to 528, Switzerland to 805, and Canada to 910. The effect of water power generated current is seen in the data. The statistics Sir Philip regards as showing very clearly the relatively backward condition of this country electrically. A further interesting comparison is that the capital invested per head of population in U.S.A. in 1923 was $42.5, or (say) £9 5s. In Canada, $77, or (say) £17; in Switzerland, £10 5s.; in Great Britain, approximately £4 15s. But such figures are not really a reliable index, in view of the fact that all the costs involved in capital expenditure vary considerably in different countries. In connection with this subject, it is interesting to observe that a great deal of electrical propaganda is under way; and, among the recent published statements, we find that it is estimated that out of 1,250,000 domestic house consumers in the United Kingdom only about 300,000 use electrical energy for purposes other than lighting.

Exhaust Gas Poisoning.

In view of the number of fatalities from carbon monoxide given off by the exhausts of motor engines, the engineers of the National Employers' Mutual General Insurance Association, Ltd. (Accident Prevention Department), Nos. 1-2, George Street, Mansion House, London, E.C. 4, have investigated this hazard. The average six-cylinder engine produces from 4 to 12 c.ft. per minute; and investigations have proved that 0·05 p.ct. of carbon monoxide in the atmosphere constitutes a danger. Working in a garage 20 ft. by 20 ft. by 10 ft., an engine may, in less than two minutes, discharge carbon monoxide in excess of this dangerous limit. An unconscious state is so quickly reached that a person in the garage rarely has sufficient time-warning to get into the fresh air. If the engine must be started-up in the garage, it is advisable to back the car out about 5 ft., and see that the rear of the vehicle is beyond the doors of the garage, and the engine emitting the fumes into the open. If for any reason the car cannot be moved, it has been found practicable to clamp a length of hose pipe to the exhaust, thus leading the gas away from the garage. The practice of running the engine in the garage must generally be condemned as an unnecessary hazard.

"The Carburettor Handbook."—Of all the components that constitute the modern internal combustion engine, and particularly the modern car engine, the carburettor is the one which can have the widest range of influence on its performance. In "The Carburettor Handbook" (published by Sir Isaac Pitman & Sons, Ltd., price 10s. 6d. net), the author, Mr. E. W. Knott, explains in non-technical language the principles and theories of carburation as they are understood to-day, and the way in which these theories are claimed to be carried into practice by the inventors and manufacturers of modern carburettors.

BENZOLE RESEARCH.

Reports of the Joint Benzole Research Committee.

As our readers are aware, the National Benzole Association and the University of Leeds have a Joint Benzole Research Committee, whose work is carried on under the supervision of Prof. J. W. Cobb in the laboratories of the University or in industrial establishments, wherever it becomes necessary. At the meeting of the National Benzole Association in March (as reported in the "JOURNAL" for March 25, p. 751), the President, Mr. D. Milne Watson, referred to the interest contained in the last issued report of the Research Committee. When the Committee first started its operations, Mr. E. C. Williams, M.Sc., was the Research Chemist until he was elected to the newly-established Ramsay Memorial Chair of Chemical Engineering in the University of London; and he was largely responsible for the researches included in the First Report, which was presented to the National Benzole Association on Feb. 27, 1924. In order that readers of the "JOURNAL" may have before them a review of the work of the Committee so far done, it is proposed to-day to deal with the First Report, and in a subsequent issue the Second Report, which is the one to which the President referred at the last meeting of the Association.

FIRST REPORT.

After consideration of the commercial and practical possibilities of various substances which exhibit the phenomenon of adsorption—chiefly silica gel and active alcohol—it was decided to carry out researches in the use of silica gel for recovery of benzole from coal or coke-oven gas.

Two theories have been advanced to explain the manner in which solid bodies adsorb gases or liquids:

1. *Capillary Adsorption.*—Condensation of the gas or vapour as a liquid in the fine capillaries or pore spaces of the adsorbent. On this assumption, the pore spaces of a given sample of gel being constant, it should take up equal volumes of any liquid whatever, and the gas volume adsorbed would be calculated from the specific gravity of the condensed liquid. This has been shown to be actually the case by exposing silica gel to the saturated vapours of water, benzole, or chloroform. The volume of the liquid taken up was the same in all cases, whether the gel was exposed to the saturated vapour or immersed in the liquid.
2. *Specific Surface Adsorption.*—This supposes that the vapour, instead of being condensed to a liquid in the cavities of the adsorbent, is held by some specific surface attraction at the face of the solid body. This specific attraction between solid and gas molecules, which, it is suggested, may be operative by virtue of unsaturated valencies, would permit adsorption to take place at a plane surface devoid of capillaries. Active charcoal probably adsorbs gases by both the above methods.

After detailing the method of preparing the gel, from 8 p.ct. sodium silicate and hydrochloric acid, a description of various experiments is given, with the data and deductions therefrom. The adsorption efficiency of the gel for benzole was high. With a 9·5 p.ct. benzole content in dry air, a gel containing over 55 p.ct. by weight of benzole was obtained. With a 0·84 p.ct. benzole content in the air, the gel produced contained 13·9 p.ct. by weight of benzole. In these circumstances it was found best to lubricate glass stoppers with *m*-phosphoric acid, and the necessity of avoiding rubber connections was proved, as the latter rapidly adsorbed benzole. The investigations into the adsorption of mixed vapours are very interesting. Commencing with a mixture of water vapour and benzole vapour, it was ascertained that benzole is adsorbed to the extent of about 8 p.ct. of the weight of the gel; but this benzole is gradually displaced until practically the whole of it is removed. The water, on the other hand, gradually accumulates in the gel.

Work was carried out at the Leeds Gas-Works on purified unwashed gas, with the object of discovering to what extent the various hydrocarbons were selectively adsorbed. Much care and clever manipulation were required in the distillations and boiling-point determinations, on about 2 c.c. of the liquid at a time. The results showed that the condensable constituents are adsorbed selectively, and that the water vapour is adsorbed more strongly than the hydrocarbons. Vapours of higher "corresponding pressure" (partial pressure ÷ saturation pressure) than benzole—viz., naphthalene, xylole, and toluole—are adsorbed before benzole itself.

Then followed a series of experiments, using larger quantities of gel, with a view to examining more closely the hydrocarbons recovered from the gas. There was surprisingly little pre-benzole, as this passed through with the gas and was not adsorbed. No carbon bisulphide was found in the lowest boiling fractions, though there was in the crude benzole slightly more than the 0·4 p.ct. of sulphur allowed in the National Benzole Association Specification.

As the volume of gas passed through the gel increased, the hydrocarbons recovered showed a gradually decreasing benzole content, while the toluole and xylole contents increased proportionately. The change in favour of the higher boiling constituents may be due either to an addition of the higher boiling constituents to a gel already saturated with benzole or to a displacement of benzole by the higher boiling hydrocarbons. The experimental data showed definitely that it was the former alternative which actually occurred. Though the percentage of benzole in the recovered hydrocarbons fell from 76·2 to 56·2, the actual amount of benzole in the gel remained constant at about 8·4 p.ct., while the content of toluole rose rapidly from 2·04 to 4·96 p.ct., and the xylole figure also increased, though not so rapidly, from 0·46 to 1·44 p.ct. It was noticed in these larger-scale tests that there was no evidence of water vapour having displaced benzole or toluole from the gel, though the results did not prove that such displacement would not occur if a still greater amount of gas was passed.

By a study of the data and the graphs therefrom, it was possible to arrive at the volume of gas which must be passed through the gel in order to obtain a motor spirit of any desired composition. It is obviously impossible to get a richer benzole mixture than that at the "break-point" of benzole (*i.e.*, when benzole begins to be displaced by higher boiling hydrocarbons), and the composition of the spirit recovered prior to the break-point is the same (77·5 p.ct. benzole, 18·5 p.ct. toluole, and 4·0 p.ct. xylole) however small the adsorption. This mixture is well in advance of the specification fixed by the National Benzole Association for motor spirit; and the composition was easily brought to that specification by passing more gas for a given weight of adsorbent, though it was evident that, in doing this, benzole was being wasted. It is useful to note that the adsorption for a maximum benzole recovery was 9·84 p.ct. by weight (or 13 p.ct. by volume) of the gel, while, if a recovered spirit containing only 70 p.ct. of benzole was required, the adsorption was allowed to rise to 12 p.ct. by weight (16 p.ct. by volume).

The second section is a report by Mr. E. C. Williams on a visit to the semi-large scale plant at Baltimore for the production of motor spirit from coke-oven gas, operated by the Silica Gel Corporation. Claims had been made regarding the production of water-white motor spirit obtained by fractional distillation from the gel; and with the object of inspecting the operation of the plant, a visit was made by Mr. Williams, Mr. Basil Sadler, and Mr. Reavell.

The plant was installed at the works of the Bethlehem Steel Corporation. The gas had passed through the usual Koppers type of coolers, tar precipitators, and ammonia washers before reaching the silica gel absorption plant. At the inlet of the latter the gas temperature averaged 90° to 93° Fahr. (higher than would be the case in normal English practice). The gas was passed through the absorption units at the rate of 75 to 80 c.ft. per minute. The powdered gel was circulated through water-cooled absorbers at the rate of 4 lbs. per minute. Three absorption units were used in series; the fresh gel meeting the gas which had previously passed through two absorption units. In this way the absorption is carried out on a three-stage counter-current system; the gel being carried up each absorption tower by the gas current, separated at the top by a cyclone, and delivered again at the bottom of the next absorber of the series by means of a small screw conveyor. This method of handling a solid absorbent by blowing it along with the gas stream appeared to work excellently and automatically once the flow had been started. The time of contact of the gel with the gas was approximately 7-10ths of a second per absorber, or a total time of contact in three absorbers of about two seconds. The gas velocity necessary for maintaining the circulation of gel was maintained by an exhauster fan at the outlet of the final absorber, capable of maintaining a pressure drop throughout the absorption system of 8 to 10 in. of water pressure. The gas entered the first absorber at slightly above atmospheric pressure, and was evacuated under 4 to 6 in. vacuum. Each absorption unit was water jacketed, to remove the heat developed by the absorption of vapours. The temperature of the cooling water on the plant was high (usually 80° Fahr.), and absorption would, for that reason, tend to be less efficient than might normally be expected, though tests showed an absorption above 90 p.ct. efficiency, indicating that a considerable latitude is permissible in the temperature of the inlet gas and of the absorption chambers.

The gel, after passing through the three absorption units, contains some 7 to 8 p.ct. of absorbed benzole, and about 10 p.ct. absorbed water (the gas being saturated with water vapour at the inlet temperature). After separation in the final cyclone, the benzolized gel is fed by means of a screw conveyor into the top of the primary activator. This is essentially a still for the distillation of the absorbed benzole and water from the gel. It is built in a form similar to the vertical pyrites burners used in sulphuric acid and oleum plants, and consists of a series of horizontal hearths placed vertically above one another. The spaces between the hearths form flues for hot combustion gases from a gas-fired furnace, and the powdered gel is moved slowly downwards from hearth to hearth by a series of rakes fixed to a central vertical rotating shaft. The final

result is that the powdered gel, as it passes through the activator, loses its absorbed vapours, which then pass to a water-cooled condenser, separator, and receiver. The debenzolized gel is discharged at the bottom of the activator. Suitable gel seals of a simple pattern at the gel inlet and outlet of the activator prevent the escape of vapours by those channels. The temperature maintained in this primary activator is 500° to 600° Fahr., sufficient to drive-off from the gel the whole of the absorbed hydrocarbons. The gel, however, on leaving the activator, still contains a certain amount of heavy polymerized or carbonized residue; and, in order to prevent a gradual building-up of such deposit in the pores of the gel, it is passed through a second activator, consisting of a horizontal rotating drum, maintained at 900° Fahr. by means of an external jacket through which hot furnace gases are passed. Sufficient air is admitted to this activator to burn-off the carbon deposit in the gel. On leaving the secondary activator, the gel is conveyed by induced draught to a cooling hopper, from which it again enters the absorption cycle.

At the beginning of the visit the plant appeared to be working smoothly and without the need of any continuous supervision. The benzole recovered, however, was of a dark yellowish-brown colour, while the water layer was black, the latter being due to a fine suspension of carbon. With a view to obtaining a cleaner benzole, much experimental work was carried out. Fractional distillation of the gel by introducing valves into the manifold vapour pipe from the activator hearths was unsuccessful, and radical alterations in the method of heating and operating the activator were also fruitless. A lower temperature and direct steaming of the gel yielded no more promising results.

Tar fog, from which trouble had been anticipated, was not found to interfere in any way either with the efficiency of absorption or, apparently, with the colour of the recovered spirit, though this latter point was uncertain. In direct contrast with plant experience, a sample of benzolized gel as supplied to the activator and distilled from a flask or small iron pan in the laboratory, gave a perfectly satisfactory water-white benzole. It was thought that intimate contact with iron apparatus might influence the colour; but a mixture of fine iron filings and benzolized gel yielded a water-white benzole on distillation. It was mutually agreed that a plant on the lines already proposed would be unsuitable for the production of a saleable motor spirit; and that, if the absorption plant were adopted, it would be necessary to submit the recovered product to some further refining process. The conclusion was a disappointment to the extent that a high-grade motor spirit had not been obtained directly from the benzolized gel. However, attention was turned to the refining action of silica gel in the liquid phase—*i.e.*, by treating with powdered silica gel the crude liquid benzole recovered from the activator. It was found sufficient to agitate the crude benzole with powdered gel in the ratio 3 : 1 or 5 : 1 in a three-stage cycle; the liquid being filtered from the gel between each stage. In practice the treatment was in the nature of a continuous counter-current process. The agitation was carried out in closed vessels, and the filtration conducted by means of continuous Oliver filters provided with gas-tight covers. The gel finally leaving the system contained about 30 p.ct. of absorbed liquid, which was recovered by passing the gel through the primary activator in the manner described above.

There was little apparent difference to the eye between the benzole which had passed the gel liquid-phase cycle and the crude benzole before treatment. There was, however, the very marked difference in fact, that if the treated benzole was now redistilled, it was found to distil water-white over practically the whole range (89 to 92 p.ct.) of the distillation. The final 10 p.ct. was very slightly coloured, but this fraction was obtained entirely above 130° C. and was therefore not employed as motor spirit. The crude untreated benzole, on the other hand, could not be rendered even approximately white by distillation. The explanation of this action of the gel apparently lay in the fact that polymerizable constituents were rendered much more active at the surface of the gel, and became polymerized to high-boiling gums or tars, which, though initially remaining dissolved in the benzole, were of sufficiently high boiling-point to be readily separated by simple distillation. It was thus possible to distil the gel-treated benzole in a still without a dephlegmating column, and obtain 89 to 92 p.ct. distilling below 130° C., and of a quality eminently satisfactory as a motor spirit.

Accurate determinations of efficiency of recovery of hydrocarbons from the gas gave a figure of 97·9 p.ct. A recovery of liquid benzole from the gel of 95·6 p.ct. efficiency was obtained. Thus a yield of crude benzole equal to 93·6 to 95 p.ct. of the amount initially present in the gas was possible. This contained 0·37 p.ct. of sulphur. The semi-large scale distillation of the gel-treated benzole yielded 88·8 p.ct. as saleable motor spirit. If 2 p.ct. loss was allowed in the liquid-phase process (it was probably 1 p.ct. or less) the over-all recovery of refined motor spirit was equal to 80 to 82 p.ct. of the total hydrocarbons in the gas.

In passing, it may be noticed that the standard colour test for "water-white" is accepted generally in America as anything less than the colour of a solution of 0·003 grammes of potassium dichromate in one litre of water.

Comparison of the gel-refined benzole with the requirements of the British Engineering Standards Specification for motor benzole showed that, with the exception of the sulphuric acid wash test and the freezing-point, the gel-recovered product was able to meet the present British specification. This raises the question of the suitability of the sulphuric acid wash test, in view of the recent developments in motor fuel technology. It is true that sulphuric acid refining of benzole has a positive value in removing harmful constituents which cause discoloration and gumming; but the harmless unsaturated compounds are removed at the same time, and these latter are a valuable portion of the motor spirit. Certain systems, of which the silica gel process is an example, conserve these unsaturated compounds; but as the latter show coloration with sulphuric acid, benzole refined by such methods will not pass the acid test, and yet may be perfectly suitable as a motor fuel. Thus an alternative to the acid test was sought, and one of the suggestions made to the National Benzole Association was the copper dish test, in which 100 c.c. of the benzole are evaporated to dryness in a weighed bright copper dish. The copper appears to accelerate the polymerization of the resin-forming constituents, and the latter remain as a dark varnish in the dish. If the spirit contains deleterious sulphur compounds, the surface of the dish is corroded. A trial run for about 45 hours on the silica gel spirit in a motor engine gave results which showed little difference from those obtained with acid-washed benzole in a similar engine. The test would have been of more value had the period of trial been a much longer one.

From the approximate cost sheet given in a short report by Mr. Basil Sadler, about one-quarter of the 5·57d., which is the cost of production per gallon, is due to gel replacement and royalty.

As regards the properties of silica gel prepared by different methods, Mr. E. C. Williams reports in a short note that silica gel prepared by adding silicon chloride to water with vigorous agitation is quite as good as that made from sodium silicate and hydrochloric acid, and has the added advantage of being entirely free from sodium chloride, which is never completely eliminated from the silicate product, even by exhaustive washing. Alkali salts greatly accelerate the conversion of amorphous silica to one or other of its crystalline forms at temperatures ranging from 700° to 1000° C.

The latter part of the report of the Benzole Research Committee for 1924 deals mainly with the purification of benzole by means other than washing, a description of an improved method for determination of sulphur in benzole, and experimental work with the object of finding a reliable method for determining the unsaturated hydrocarbons in benzole. Owing chiefly to the production, by cracking, of spirits containing up to 30 p.ct. of unsaturated hydrocarbons, a method of refining other than by means of sulphuric acid would be welcomed by producers of motor spirit. With this object in view, experiments were carried out using intensive oxidation to accelerate the production of insoluble resinous matter by the gum-forming constituents of unrefined benzole. It was found that the passage of air at atmospheric pressure caused little change, so air oxidation under pressure (200 to 400 lbs.) was tried, at varying temperatures. The results were interesting, and showed that the content of unsaturated hydrocarbons could be reduced in a short time to an extent almost equivalent to that obtained by the usual sulphuric acid washing process. The distilled benzole after treatment was still nearly water-white after six months' exposure to full daylight, while the untreated benzole developed a strong yellowish-brown colour. The experiments were unfinished when the report was published.

The chief difficulty in investigating these oxidation reactions was the lack of an analytical method which would give a measure of the resin-forming constituents in the benzole; and such a method is provisionally put forward. This depends on the determination of the bromine addition value of the spirit before and after the removal of the gum-forming constituents by refluxing with sodium strips for two hours. This entailed an investigation of the methods available for the determination of unsaturated constituents in benzole; and the conclusion was drawn that the acid washing test and the permanganate (oxygen absorption) test have sources of error. After an exhaustive examination of Wij's method of determining the iodine value of an unsaturated substance, it was found that the iodine value for a benzole was, at the best, an empirical one which is dependent to a considerable extent upon the conditions under which the determination is made. McIlhiney's method for the separate measurement of halogen addition and substitution values was then investigated; and the report states that this method is the most satisfactory one yet examined for determining total unsaturation.

In conclusion, an improvement is suggested to the method recommended by the British Engineering Standards Association for determination of sulphur in benzole—drawing the benzole vapour, with secondary air, over heated platinized silica and absorbing the products of combustion in sodium hypo-

bromite solution. As it is difficult to vaporize the benzole completely from the cotton wool used in the test, the modification suggested is the use of silica gel instead of cotton wool. From this gel the benzole is given-off slowly and continuously into the air stream, and is completely volatilized by heating to red heat towards the end of the test.

CULTIVATION OF DOMESTIC AND OTHER COKE MARKETS.

[From a Paper by E. W. Smith, D.Sc., F.I.C., and F. S. Townend, B.Sc., before the Midland Institute of Mining Engineers.]

Coke satisfactory for domestic work should have the following properties :

(1) Good combustibility.
(2) Low ash, sulphur, and moisture
(3) Uniformity of size, the coke being screened and sized to suit the particular purposes.

We would urge that the last two items are of paramount importance, and that improved combustibility, even with cokes as produced to-day, would follow if these requirements were given adequate attention.

Requirements of Coke

Up to the present there appear to be no comprehensive specifications to which the various classes of coke should conform. Such as have been proposed are confined largely to the ash, sulphur, and moisture contents, together with the appearance and hardness. The absence of any reference to the property known as combustibility is probably due first to the fact that it is only during the last few years that it has been realized that this property plays so important a function as it undoubtedly does, and, secondly, to the fact that there is no satisfactory test which gives results indicating precisely the value of a coke's combustibility.

Combustibility.—The usual methods of determining reactivity adopted by Wheeler, Bähr, and other investigators consist in passing oxygen or carbon dioxide through a layer of coke heated to a definite constant temperature; the resulting gases being subsequently analyzed, and a formula used to express the analysis in terms of a constant. This method is essentially a laboratory one, and depends on the particular conditions of temperature and time adopted in the experiment. While yielding results of interest, it appears that, for the practical working of a specification, a more robust test is required.

H. Koppers has shown that when coke is burnt in a fuel-bed of definite thickness by blowing it with air at a definite rate, the length of flame above the fuel-bed is a measure of the combustibility. A modification of this same method has found a certain amount of favour, especially in America. A small vertical refractory-lined shaft is built about 5 ft. high and 18 in. in inside diameter. The base of the shaft is fitted with a grate, beneath which is a closed ashbox, into which can be blown air at any definite rate. The sample of coke is carefully screened and sized, and a definite quantity dumped on to the grate in the shaft. A coal-gas jet plays for a certain time on the lowest layers of the coke, to start combustion, and then a definite quantity of air is admitted under the grate according to a pre-arranged schedule. After the lapse of a stated interval of time, the coke which remains unconsumed in the furnace is dumped into the ashbox, cooled, and weighed. The percentage of the carbon burnt is a measure of the combustibility of the coke. By this method a fast-burning coke will show a percentage of carbon burnt of 90 and more, and a slow-burning one about 60 p.ct. This test undoubtedly gives a figure which shows the combustibility.

Coke Structure.

Stress has been laid on the question of the combustibility of a coke; and it will be of interest to review the factors on which this property appears to depend.

Coke structure may vary in the following particulars :

(1) Size and uniformity of pores and connecting passages.
(2) Amount of space occupied by the pores and passages (porosity).
(3) Thickness of the cell walls.
(4) Nature of the cell walls.

The high absorptive capacity of charcoal depends not wholly on the total porosity, but on the presence of innumerable small pores and passages of minute dimensions. As charcoal is the most easily combustible carbonized fuel known, there is little doubt that its high absorptive capacity and combustibility are intimately connected. It is probable, therefore, that the size of cells, unless they be of dimensions of the order of 1×10^{-8} cm. have not a great influence on combustibility. Nevertheless, since uniformly-small cells present a greater surface per unit of cell volume than large and irregular-sized cells, they must tend in the direction of greater combustibility.

The percentage of the volume of coke occupied by cells is not in itself a good criterion of combustibility, as a given percentage of cell volume may be disposed either as large pores and thick walls or as small pores and thinner walls. The apparent specific gravity, which is the actual weight of coke-substance in a given volume of coke, is a better indicator of combustibility, for it may be said that a coke having a lower apparent specific gravity will in all probability be more combustible than one of higher apparent specific gravity. The degree to which the size, uniformity, and amount of pores can be modified in the coke-oven is somewhat limited, and it is doubtful whether the difference in combustibility between charcoal and coke can be much reduced unless grinding and blending along the lines suggested by Sutcliffe and Evans are adopted.

Thickness of Cell Walls.—The factors of the thickness and nature of cell walls are, however, susceptible to considerable modification in the coking process.

Greenwood and Cobb have shown that the thickness of the cell walls undergoes considerable change according to the temperature to which the coke is subjected. The results of their experiments demonstrated that up to temperatures of 550° C. the coke was soft, with thick walls and low specific gravity. Between 550° and 850° C. the walls were thinner and the specific gravity was greater. At higher temperatures there was a large contraction of the coke. The walls became thicker, the pores smaller, and the specific gravity further increased. This would appear to point the way to a coke produced at temperatures below 850° C. as being necessarily more combustible than a high-temperature coke.

It must be pointed out that, in addition to the temperature, the duration of the coke at the particular temperature must be taken into account. There appears to be no evidence that a coke which has never been subjected to a temperature greater than 850° C. is necessarily more combustible than a high-temperature coke from the same coal, which coke has not been subjected to long baking at that temperature. Comparatively low temperature coke is less strong than that formed at higher temperatures; and the advantages to be gained in the way of increased oven outputs by the use of fast coking times would seem to mean that increased combustibility must be sought by reduction in coking time rather than by the use of lower temperatures.

Nature of Cell Walls.—It has formerly been accepted that the comparative incombustibility of coke has largely been the result of a deposit of graphitic carbon on the cell walls, resulting from the decomposition of ethylene, methane, &c. Recent conceptions of the nature of the cell walls lead to a modification of that view. It has been calculated that under the worst conditions the thickness of the cell walls is some thousand to ten thousand times that of any graphitic deposit likely to be formed, and the conclusion seems fully justified that, though the ignition temperature may be affected, it must be the nature of the cell walls, rather than the deposit, which determines the combustibility.

Blending.

During the past few years, the question of the scientific blending of coals has received considerable attention from many workers. Interest in this subject was again revived by the paper by John Roberts read before the North of England Institute of Mining and Mechanical Engineers in 1921, in which the following principle was advanced :

" The maximum rate of heat-transfer through the mass, consistent with the formation of suitable coke, is obtained only when the condition of the charge is such that no excess binder is present."

Heat-penetration curves were published in support of this view. This work has been confirmed by Weyman, E. V. Evans, and ourselves. The improved heat-transmission results from the restriction of the development of the plastic layer, which acts practically as a non-conducting zone. We concur in Mr. Roberts's view that slow coking in wide ovens results in the destruction of the excess binder of strongly-coking coals; heat energy being needlessly used up in the destruction of this binder. In order to employ the binder usefully, and at the same time to affect great improvement in the rate of heat-penetration, Roberts proposed that all strongly-coking coals should be blended with inert substances such as coke-dust and non-caking and feebly-coking coals.

We are satisfied from the results of our experiments that judicious blending undoubtedly does produce the effects described, prevents expansion of the charge, and reduces the coking time; the resulting coke being of a uniform and strong nature. Narrow ovens which ensure rapid, uniform heating can, of course, employ larger proportions of inert coals than can be used in wide ovens.

The Gas Turbine.—Mr. König, in a paper presented to the North-East Coast Institution of Engineers and Shipbuilders, pointed out that a wide field of application for a successful gas turbine was represented by power plants operating on gas from blast furnaces, coke ovens, and gas producers. A successful gas turbine, furthermore, became of increasing importance with the trend—faintly marked as yet—to avoid the wasteful direct burning of coal by the adoption of low-temperature gasification on a large scale. In this case the direct use of the gas in internal combustion turbines would seem to be the most economical procedure.

RIVER POLLUTION.

The Tar and Bitumen Question.

The Standing Committee of the Ministry of Agriculture and Fisheries, dealing with the subject of river pollution, have issued Part 2 of their report. This constitutes a non-technical statement on the work carried out during 1924, as well as an outline of the scheme of scientific work which it is proposed to undertake in the immediate future. During the twelve months, it appears that the work of the Committee has continued on an extending scale, and yet they have not been able to comply with the whole of the applications for investigation and advice which have reached them. They believe that their labours, so far, have caused public opinion to be more alive than heretofore to the fact that filthy rivers are not a necessary accompaniment of advanced civilization. In continuation of the practice the Committee adopted from the outset, scientific investigations of the effects upon fish of various polluting effluents have been carried out, and by co-operation between the Committee and industrial firms remedies have been found for, and applied to, a number of specific pollutions.

In the present report the Committee deal largely with the condition of rivers as revealed by inspection and survey, and also with the scientific aspects of pollution. It is clear from what is said that a large proportion of the pollution which is deleterious to fish life is caused by sewage works, and by the effluents of different industrial processes. But a matter which requires very careful research is that of the effects of the complex pollutions caused by the mixture of different polluting effluents. Those views are gathered by a perusal of the reports on the conditions of the different rivers; but we will here confine ourselves to a reproduction of points made by the Committee in which gas-works are interested. From these it will be seen that the Committee are very definitely of opinion that the tar dressing of roads in proximity to rivers and streams in which there is fish life is culpable for much of the destruction that occurs. Furthermore, they are distinctly of the view that in such cases bitumen should displace the tar dressing.

Dealing with the River Wear, it is stated that the tidal waters are rather heavily polluted by coal mines, coke ovens, chemical works, gas-works, and sewage. Then as to the River Tees, it is stated that the upper waters are in good condition, but the lower waters are badly polluted. Scientific observation has found that the water is heavily charged with products of a tarry character which are deadly to fish. In addition, it is stated, effluents have been analyzed and found to contain large amounts of tar products and of acid from pickle liquors. In this case a Joint Committee has been formed of representatives of the Tees Fishery Board and the manufacturers, to take in hand the examination and improvement of the industrial effluents discharged into the river; the expenses being borne jointly. It is hoped that some of the various methods of treatment of coke-oven effluent will be tested-out under the ægis of the Joint Committee, with a view to the discovery of the most effective and practicable processes. In referring to the River Trent, an observation is made as to the River Erewash receiving a number of effluents from coke ovens. Independent analyses of the waters of the River Wye (Derbyshire) have indicated sewage pollution and the presence of tar acids. That was in July last. In the following month the river was examined both chemically and biologically; and the results showed that the chief sources of pollution were from the roads and a gas-works. At the time of the survey, road-tarring operations were in progress, and it was obvious that the washings (there had been heavy rain) were running into the river. Samples taken from puddles in the road showed, on analysis, appreciable quantities of tar acids and tar bases; and samples of the river water itself also contained tar. In addition, mud taken from below a gas-works discharge-pipe had a distinct smell of "coal gas," and also contained a considerable amount of tar, which, it is thought, could not have been derived from road washings. The question has been taken up with the Highway Authorities concerned; and it is confidently anticipated that as a result some, at any rate, of the causes of the deterioration of the very valuable Wye fisheries will be removed.

There is no more indictment of tar until we come to the River Darent. In this case, from 1908 the stock of trout in the river rapidly diminished despite re-stocking, and there are now no fish at all. From information supplied to the Committee, they state that the decline synchronized with the commencement of the practice of tarring the roads in the vicinity; but while the tarring of roads appears to have been the primary cause of the pollution, there were certain other minor sources, and the whole effect has been accentuated by the reduction of water in various lengths of the river through the sinking of wells in the valley. A survey at the end of May, 1923, definitely established the presence of tar acids in the water. It is understood by the Committee that the Kent County Council are gradually re-surfacing with bitumen the roads which drain into the Darent; but owing to their considerable mileage it has not yet been possible to deal with all of them. As soon as the re-surfacing is complete, it is hoped that successful re-stocking in the river may be commenced. Regarding Hampshire rivers, the Wylye between Warminster and Salisbury is reputed to be suffering as a result of road tarring in the vicinity. A visit to the river and the adjoining roads revealed the fact that, as a whole, the roads are now satisfactorily treated. Some local authorities, however, are still using tar dressings, and the Ministry of Transport, at the request of the Fisheries Department, have taken up the question with the authorities concerned. In connection with the pollution by tarred roads of the Itchen between Winchester and Eastleigh, the Test and Itchen Trout Fishing Association convened a meeting in February, 1924, at Winchester, in order to discuss with the local Highway Authorities concerned the desirability of substituting bituminous road dressings for tar on roads draining into the river; and, as a result, an agreement has been arrived at which should ensure that no further pollution from this source will occur in the future. In other directions we see that lead-mining operations are also arraigned for their polluting propensity.

The next section of the report deals with future work, and it is held that for the maximum usefulness progress must be made along lines of scientific investigation. From this section, we quote *in extenso* the following portion:

"In this connection the Committee desire to allude again to one topic dealt with in their first report—namely, the effect upon fish of the washings from tar-dressed roads—because the investigation of that subject has produced definite conclusions which have been successfully put into practice in many places, and are capable of still wider application. The Committee desire to emphasize the fact that the experiments conducted by the Fisheries Transport Committee (upon which a report will very shortly be issued) showed conclusively that washings from a tarred road killed fish, though the degree of toxicity varied according to the state of the road; the most toxic washings being obtained immediately the tar was applied and when the surface of the road was breaking up. It is obvious that if there is no rain immediately after the tar is laid, only slight damage may result for a time—particularly if the river concerned is a large one. But there is always a risk that a sudden downpour will occur as soon as the tar is laid; and, in such a case, all the fish in a large stretch of river may be exterminated; and the danger is no less when the road breaks up.

"As far as tests have shown, whenever a compound road material is used which contains an appreciable quantity of tar, it may be anticipated that at some time or another in the history of the road the rain washings will be of a toxic character. On the other hand, the experiments carried out by the staff of the Fisheries Department with bitumen showed conclusively that even undiluted washings from bituminous surfaces were harmless. The Committee are glad to know that the substitution of the bituminous road dressings for tar on roads, the washings from which may gain access to fishing streams, is progressing all over the country; but isolated cases have been brought to their notice in which the surveyors of local authorities hold firmly to the opinion that tar is not injurious to fish—basing this opinion on their personal observations in their local streams, or on statements that have appeared in trade journals. It cannot be too emphatically stated that this opinion is entirely contrary to the facts as disclosed by the reports of the Joint Fisheries Transport Committee.

"In the case of road tarring, it was possible, by a comparatively simple experiment, to demonstrate its inevitably prejudicial effects upon fisheries, and by similar experiments to demonstrate the harmlessness of washings from bituminous roads. The Committee therefore, being in a position, not merely to point out the deleterious effects of tar, but also to indicate a simple remedy for them, felt justified in pressing, and pressed successfully, for the application of the remedy. Similarly, wherever they become aware of a specific pollution for which they can offer a practicable remedy, whole or partial, it is their policy to press for the application of remedial measures. This policy, which has been attended with encouraging results in the past year, will be steadily pursued in the future. But the number of cases of general pollution for which simple and practical remedies can be suggested is, as yet, small; and the Committee, conscious of the difficulty and complexity of the scientific problems, the solutions of which must precede the effective treatment of pollution in general, asked early in 1924 for the support of a scientific advisory body, to ensure that future work should be conducted on lines both practical and scientifically sound."

To that end, the Ministry have appointed a Scientific Advisory Committee to advise the Standing Committee on all purely scientific questions. This Committee is constituted as follows: Prof. A. E. Boycott, F.R.S. (Chairman); Dr. H. T. Calvert, D.Sc., Ph.D., F.I.C.; Mr. J. H. Coste, F.I.C., F.Inst.P.; Dr. H. H. Dale, C.B.E., F.R.S.; Dr. J. A. Gardner, M.A.; Dr. E. C. Jee, D.Sc., F.I.C.; Mr. G. Bertram Kershaw, M.Inst.C.E.; Prof. E. W. M'Bride, F.R.S.; Sir Robert Robertson, K.B.E., F.R.S.; Dr. E. S. Russell, D.Sc.; and Dr. E. J. Salisbury, D.Sc.

Finally the report deals with the programme of research approved by the Scientific Advisory Committee. It consists of river surveys, physiological tests of effluents, examination of dead fish, analysis of effluents, tests of constituents of effluents, and purification of effluents, with an investigation of the general problem of the relation of fish life to pollution.

Annual General Meeting of the "S.B.G.I."—As already announced, the annual general meeting of the Society of British Gas Industries will be held in the Hotel Cecil, London, W.C., on Wednesday, May 20—Mr. D. Milne Watson, D.L., M.A., LL.B. (the President), in the chair. At 2.30 there will be the general business meeting, and this will be followed at 3.30 by the President's Address, and the induction of the new President (the Right Hon. Sir Alfred Mond, Bart., M.P.). At 7.30, in the Hotel (Embankment Entrance), the annual dinner will take place.

GAS STOCKS AS GILT-EDGED INVESTMENTS.

By C. B. Tully.

Not many years ago, the majority of gas investments were considered gilt-edged securities. Even the smallest village works was a sound dividend-earning proposition; and there is no reason why this should not be so to-day. It does not reflect credit on the gas industry to see so many of the small concerns —often the pioneers and the first works started in the country— closing down. No doubt this state of affairs is largely attributable to the war and its consequent economic disturbance; but I think it is hardly to be disputed that too many of the smaller works have failed to keep pace with the general development of gas manufacture. Notwithstanding the increase in cost of coal and labour, and the unremunerative price obtained for coke, many works still carry on, upon the identical lines of fifty years ago. Why this should be, it is difficult to understand.

A few years ago the writer caused some amusement by describing a small village works that closed-down for the week-end while the manager went to the seaside. There are now works of 20 million c.ft. per annum, and many others, making all the gas they require in eight hours, and closing-down for the remainder of the day, without any loss whatever. Many small works have been put on a sound financial footing, especially in Scotland. One instance is a works of 9 million c.ft. per annum, which was purchased for £5000. This is selling 12 millions, and is making a profit of over £800 per annum. This is only one example among many works that might have been closed-down, but which have been saved from ruin and rendered prosperous.

A number of these small concerns, no doubt, started to get into financial difficulties during the war, or during the several unsettled years that followed, with the result that they are now —especially with the present slump in coke—unable to show a satisfactory balance, while the drained reserves render the purchasing, from funds in hand, of new and up-to-date plant impossible. There should, however, in most cases, be no great difficulty in finding the necessary extra capital to provide modern plant, and put these concerns on a sound financial basis. It is faulty management to allow matters to drift from bad to worse; and with the vanishing coke market, and the dumping that will take place, it is more important than ever to deal with these concerns on genuine business lines.

A gas concern has to make a profit to live; and to do so it does not matter what standard of gas supply is adopted, be it 500 or 350 B.Th.U., so long as it gives satisfaction to the consumers. It has been established now beyond dispute that gas of 350 B.Th.U., if properly handled, will give all-round satisfaction whatever the use to which it may be put, and will earn a dividend for the shareholders. To adopt 350 B.Th.U. gas, and complete gasification of coal, converts a gas-works into a gas-generating station, and does away with all the worry and anxiety attached to the sale of coke. Of course, it is quite understood that many of the large gas undertakings cannot drop the calorific value on account of distribution troubles; but in smaller concerns such troubles can be overcome, always having in mind the £ s. d. view of the matter.

The coke market is, and always will be, an unsatisfactory business, for, should a small concern go to the trouble of studying the local coke market, and make a good soft coke, some large company or factor will start dumping inferior coke on them, and will ruin their market. Taking everything into consideration, it is better to restrict the manufacture of coke as much as possible, or cut it out altogether, as many of the American companies have done. The present slump in the coke market is not at all a temporary matter. It has come to stay; being primarily due to the over-production of oven coke. On the Continent, coke-ovens are closing-down, as there is no market for the coke, and they cannot carry on at a profit. In America there is a vast over-production of oven coke, there being at present more than one-and-a-half million tons in stock. This has a poor demand at 7s. per ton; but there is little fear of competition, as it costs 20s. to freight it to the coast. Something has to be done, and that quickly. It is poor business, as is being done in some cases, to buy coal at 26s. per ton, and have to sell coke at 20s.

The writer has no axe to grind for anyone, and is not associated now with any low-temperature concern; but he does think that the gas industry should turn its attention most seriously to the important proposition of the low-temperature carbonization of coal and to the manufacture of smokeless fuel, and not leave it to outsiders. The manufacture of this fuel will provide about 50 therms of enrichment per ton of coal treated practically for nothing. This is a sound proposition, and would save buying oil abroad and sending much-needed money out of the country. One ton of slack coal carbonized at low temperature will produce 40 therms of rich gas and 10 therms of gas oil—together equivalent to 50 gallons of gas oil; also 14 cwt. of smokeless fuel, and 10 gallons of heavy tar. Work it out, and it will soon be seen what there is in the proposition.

EVOLUTION OF THE VERTICAL RETORT.

In connection with the admirable paper by Mr. Walter T. Dunn, reported in our April 22 issue, comment has been excited by the omission, though chronological order was stated, of any detailed descriptive paragraph of the "Dempster-Toogood" system of continuous verticals. This system was, in the author's résumé, chronologically No. 8, and was fully represented at the lecture by illustrations, drawings, pamphlets, and working models, for the loan of which due acknowledgment was made to Messrs. Robert Dempster & Sons, Ltd., of Elland.

Mr. Dunn chronologically dated this system for 1912; and though the principle of continuous carbonization is the same in all vertical retorts, the advent of the "Dempster-Toogood" system was marked by the thoroughness of the development of each of its many detail departures, and by the ingenuity with which all its details were rendered subservient to the main essential—viz., the continuity of descent by gentle gravity alone.

The Dempster-Toogood system is chiefly characterized by:

Its extended portion of brickwork (coming immediately beneath the heated retort, and above the coke-extracting mechanism) being made always of larger cross-sectional dimension than the retort itself, whereby the descending coke formation is opened out into coke pieces, for the better intermingling of steam, and for the more ready cooling and preparing of the coke before extraction.

Its coke-extracting mechanism, consisting of an adjustable reciprocating tray, performs two functions, for not only does it regularly extract the coke, but the known tendency of coke to bridge-over is, by this unique two-fold motion, overcome to the advantage of continuity of descent.

Its central ingress for coal at the top of the retort, whereby the natural phenomenon of rolling nuts is utilized advantageously to build a balanced charge of coal.

Its disposition of maximum temperatures; the active flames of combustion being 6 ft. down from the top of the retort, then burning downwards, and afterwards crossing the extreme top of the retort, to regenerate the cold incoming coal, whereby the most highly stressed or highly heated refractories are in such a safeguarded position as to be (*a*) relieved of the erosive effect of moisture in down-coming coal or rising steam, (*b*) out of reach of harm by stoker's bars, and yet, while relieved of excessive weight of superimposed brickwork, (*c*) in relatively easy reach for economic re-setting.

Its double tapered retort, offering maximum taper to the swelling coal above, and minimum taper to the shrinking coke beneath.

The system is well represented in the southern counties; the Great Western Railway having chosen it for providing the huge quantities of gas required for the modern shop practices in the speedy heat treatment of metals.

They have installed a very complete 3,000,000 c.ft. per day plant at their Swindon Works, and the various uses they make of this amazing quantity of gas were exemplified in a recent issue of "A Thousand-and-One Uses of Gas."

United States Gas-Works Statistics.

Statistics compiled by the American Gas Association show that the manufactured gas companies of the United States in 1924 sold 405,000 million c.ft. of gas—an increase of 20,000 million c.ft. over the preceding year. In the last six years the sales have gone up no less than 100,000 million c.ft. New customers taken on last year numbered 440,000, making a total of 10,240,000 at Dec. 31 last. The sales of appliances for the year reached 800,000 gas ranges, 450,000 water heaters, and 500,000 heating stoves—truly inspiring figures for the salesman. At the same time, the use of gas in industrial processes is progressing at an unprecedented rate; the sales in this one field alone during the last ten years showing a growth of 1000 p.ct. Another large-volume business of an attractive character has been found in complete house heating, for which installations are now being put in at the rate of 10,000 a year.

Heating Calendar Rolls by Gas.—The application of gas to the heating of calendar rolls in a plant at Pawtucket was cited by Mr. C. S. Hilton, of the Blackstone Valley Gas and Electric Company, Pawtucket, in a paper which he read before the New England Association of Gas Engineers. These rolls had previously been heated by steam. Condensation of the steam inside the rolls, however, limited the temperature which could be reached. When gas was utilized as the heating agent, the application was made in such a manner as to bring the temperature to the highest safe point, thus materially speeding-up the production, and giving the machine an output greater than would have resulted otherwise. Floor space and other savings resulting more than offset the cost of gas.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Annual Meeting at Newcastle-on-Tyne.

THE Annual General Meeting of the North of England Gas Managers' Association was held on Friday, May 1, at the County Hotel, Newcastle—Mr. S. SHADBOLT, the President, in the chair.

Mr. NORMAN S. COX, Hon. Secretary and Treasurer, announced that letters of regret for absence had been received from Mr. C. H. Armstrong, Mr. Blundell, Mr. Doig Gibb, Mr. Shapley, Mr. Rufthead, and from Presidents and Secretaries of kindred associations.

The statement of accounts for the past year had been circulated among the members, and was submitted by the PRESIDENT. This was adopted on the motion of Mr. T. LAW, seconded by Mr. F. C. WILLIS.

The PRESIDENT moved the confirmation of a recommendation of the Committee that a donation of £10 10s. be contributed to the Benevolent Fund of the Institution of Gas Engineers. He said it was a small sum for a very worthy object.

Mr. C. DRU DRURY seconded, and the motion was agreed to.

Transfers to full membership: Mr. J. E. Dixon, of Elswick; and Mr. C. S. Read, of Washington.

ELECTION OF NEW MEMBERS.

Member, Mr. W. Millard, of Bridlington. Associates: Messrs. J. E. Wakeford, of Stockton; A. H. Nicholson, of Stockton; S. W. Scurr, of Monkseaton; T. Rudd, of Sunderland; and J. W. Pallister, of Middlesbrough.

EDUCATION SCHEME.

The PRESIDENT reported on the action of the Committee, on a recommendation from the Special Purposes Section, since the last meeting of the Association, in connection with the Institution Education Scheme. Most of the members would be aware, he said, that in various districts a local committee had been appointed as an advisory committee for local purposes—a body to whom students might refer in any case of difficulty or misunderstanding, so that someone with a little status, and representing local interests, might be there to advise and help them. During the last six months the Committee appointed a Sub-Committee to consider the scheme; and it had been proved to the mind of the Committee that it would be a good thing if they copied the example of other districts, and appointed a local committee to advise between the students and the central authority. Mr. Shadbolt had been convener of the Special Committee, which comprised, with power to add to their number, Messrs. C. Dru Drury, A. W. Branson, F. P. Tarratt, Herbert Lees, and W. W. Atley.

Mr. T. P. RIDLEY moved the confirmation of the Special Committee; and this was agreed to.

SOME EXPERIENCES WITH GASHOLDER TANKS IN A MINING AREA.

By CHAS. DRU DRURY, of Sunderland.

The gasholder tank is an important item in the equipment of a gas-works, not only on account of its initial cost, but also from the fact that any defect in its soundness has a serious effect on the holder of which it forms a part. The design and construction, therefore, of a tank on ground liable to subsidence require serious consideration by the responsible engineer.

As is well known, gasholder tanks are constructed of various materials and in various manners. Cast iron, stone, bricks, concrete, reinforced concrete, and steel have been used for this purpose. Where the formation of the ground necessitates, tanks, annular in shape, have been cut out of the rock and lined with water-proofing material. Tanks are constructed wholly in the ground, or partly sunk, or built wholly above ground, to suit varying conditions and requirements; but, of course, none is wholly proof against the effects of subsidence, should it occur. Even a "tankless" holder in like circumstances would not be immune from trouble. The writer trusts that the following detailed account of experiences, with which he has been more or less intimately associated, will be of interest.

A brick tank 85 ft. 6 in. in diameter, by 22 ft. deep, entirely sunk in the ground, with puddled domed bottom and puddled backing to the wall, constructed nearly fifty years ago, had originally contained a single-lift column-guided holder. This holder was subsequently replaced by another of three lifts, spiral-guided. Shortly before the conversion, a deep pit shaft had been sunk by a colliery company, and coal workings begun in the immediate neighbourhood, followed by the appearance of cracks in several buildings in and around the works. Considerable trouble was also experienced from broken gas mains and drawn joints in the district. After the new holder had been at work for a short time, loss of water was detected, and the tank was found to be 1¼ in. out of level. The leakage increased to such an alarming extent—the drop in the water being about 17 in., or 45,000 gallons, in 24 hours—that the holder had to be landed, and the tank emptied. On examination of the interior, it was found that there were no less than 12 vertical cracks in the wall, varying respectively from $\frac{1}{8}$ in. to $\frac{1}{2}$ in. in width. The lifts of the holder were raised, to enable the wall to be repaired, which was effected by cutting-out the brickwork where the worst cracks were found, grouting with cement, and making the brickwork good again. The finer cracks were grouted and pointed up.

When refilled, there was still a slight loss of water from the tank, amounting to about 2500 gallons per day; and this leakage has continued, but without increasing, for the past three or four years. The leakage is, however, made up by turning on a supply of water from time to time. The tank having been weakened by the movement of the ground, it was considered unwise to submit the tank wall to the stresses transmitted to it through wind pressure acting on the holder when fully inflated; and it was therefore decided that no more than two of the three spiral lifts should be used in future.

A small two-lift spiral holder in a steel tank 75 ft. in diameter by 20 ft. deep was erected above ground on a reinforced concrete raft, 12 or 13 years ago. There was general evidence of subsidence in the district; and when some alarming cracks developed in the buildings in and around the gas-works, the position was carefully looked into, and the tank was found to be 5⅜ in. out of level—the tilt being in a direction which clearly indicated the source of the trouble. It will be recognized that a serious situation had arisen when a two-lift spiral holder was compelled to work under such an adverse condition; and it was decided that the holder must be laid off, and the tank emptied and re-levelled on its foundation.

A cast-iron tank 62 ft. in diameter by 18 ft. deep, containing a three-lift column-guided holder, having a capacity of 130,000 c.ft., was erected in 1881 on the site of an older brick tank, and was sunk in the ground to a depth of 10 ft. The side was formed of four tiers of plates 4 ft. 6 in. square and about $\frac{3}{8}$ in. thick, with flanges strongly bracketed between bolt holes, and the plates themselves stiffened by external diagonal ribs. About thirty years after its erection a slight loss of water in the tank was noticed. It was also discovered that the tank was 2½ in. down on one side, and that cracks had developed in one or two of the adjacent buildings. The leakage which was slowly increasing amounted at that time to about $\frac{3}{8}$ in., or 600 gallons, per day; and as none was visible externally, the ground against the side of the tank was excavated in likely places, and a crack was found running vertically through two plates in the two lower tiers, and from it water was freely issuing. The holder was landed and the water pumped out of the tank, the lifts of the holder being raised some 10 ft. to enable the inside of the tank to be inspected thoroughly. The full extent of the crack was located, and a small hole was drilled at each end to prevent it from spreading. A steel plate 9 ft. 6 in. long, 3 ft. 4 in. wide, and $\frac{3}{8}$ in. thick was procured, bent to the curve of the tank and bolted over the crack inside the tank; the joint between the steel and cast-iron plates being made with felt well soaked previously with red lead paint.

In addition to the crack referred to, one or two smaller cracks were found in the bottom radial plates; and these were also patched on the inside with steel plates secured by tap bolts. During the repair of the cracks, water accumulated in the excavation which had been carried down to the bottom of the tank, outside; and this water was kept-down by pumping until the patching had been completed. When all was finished, the pumping was stopped one morning; but later on that day, well into the afternoon, a report was heard all over the works, emanating from the gasholder, when it was found that twenty of the radial tank plates had burst upwards, and that water to a depth of about 6 in. was lying over the bottom of the tank. These plates had cracked at a distance about half-way between the centre and the side of the tank; and the crack extended for a length of about 48 ft. When the broken plates were removed, it was found that the tank had originally been bedded on coarse rubble; and owing to the water-logged nature of the ground round the tank, the head of water which accumulated as soon as the temporary pumping had been stopped was sufficient, with the tank empty, to burst-in the bottom. The damage was repaired by obtaining and fixing new cast-iron radial plates.

In order to consolidate as far as possible the rubble under the bottom, cement grout was run in through a ¾-in. hole drilled in every alternate bottom plate; the holes being subsequently tapped and plugged-up. The tank, when filled with water, was found to be perfectly tight, and has remained so ever since—a period of fourteen or fifteen years. While the tank was being filled, and until it was nearly full, large bubbles of air were noticed coming at intervals from under the bottom and breaking through the water which had collected in the excavation outside. This phenomenon was no doubt due to the weight of water inside the tank flattening that portion of the bottom which had lifted slightly when it had burst upwards.

A brick tank 72 ft. in diameter by 20 ft. deep, entirely sunk in the ground, with puddle backing, contained a single-lift

Fig. 1. Fig. 2. Fig. 3.

column-guided holder. The history of this case is that some fifteen or sixteen years ago the side of the tank cracked badly in two places—clearly the result of subsidence—and about the same time two of the cast-iron columns fractured, one round the base and the other across the foot (figs. 1 and 2). The cracks in the wall were repaired from the inside, but the tank was never tight, and it gradually began to leak more and more until the water would only stand at half its full depth. When consulted in the matter, the writer inspected the tank and found that it was $7\frac{3}{8}$ in. out of level, with a clearly-defined tilt in one direction, and that there were now five bad vertical cracks in the tank wall; two being the old ones which had re-opened (figs. 3, 4, and 5). These cracks varied respectively from $\frac{1}{2}$ in. to 2 in. in width; and since no assurance could be obtained that subsidence or the effect of underground workings could be said to have ceased, and in view of the unsatisfactory result of the previous repairs, it was decided to abandon the

Fig. 4.

holder and tank, and to construct a new spiral holder in a steel tank on a reinforced concrete raft on an adjoining site, which was further removed from the influence of pit workings.

A masonry tank 103 ft. in diameter by 22 ft. deep, with puddle backing and flat puddled bottom, constructed about 1858, and entirely sunk in the ground, had originally contained a two-lift column-guided holder having a capacity of a little over 250,000 c.ft. of gas. At a considerably later date, a third lift, rope-guided, was added, and about sixteen years ago there was a further addition made of a fourth lift, also rope-guided, bringing up the capacity of the holder to about 500,000 c.ft.

Some twelve months after the fourth lift had been added, a slight loss of water—about $\frac{1}{2}$ in., or 2000 gallons, per 24 hours—was noticed; and as attention had been drawn to cracks in buildings and reports of subsidences in the neighbourhood, the level of the tank was ascertained, and it was found that it had a tilt of about $3\frac{1}{4}$ in. Fifteen months later the loss had increased to 3 in., or 13,000 gallons, per 24 hours; and it was then decided to adopt the expedient of dropping mill-dust into the water between the tank wall and the holder; the idea, of course, being that the mill-dust, as it soaked, would sink and be drawn gradually by the current of water to the crack or cracks in the tank, and thus stop, or at any rate reduce, the leakage. It was known that this method had been adopted in several places with considerable success; but in the case in point, though some 8 tons in all of mill-dust were so used, no benefit was derived; in fact, the leakage continued to get worse. There was therefore nothing left but to land the holder and empty the tank. Before this was quite empty, the pump was stopped, and an inspection of the interior was made from a raft, with the object of ascertaining whether or not a current of water could be discovered leading to the seat of the trouble. Corks and small paper boats were distributed over the surface of the water, and left there for a week-end; but no definite information was thus obtained. Though the head of water was now greatly reduced, the leakage continued at the rate of about 1 in. per day until the tank became completely empty; and, owing to the fact that the bottom was covered by the mill-dust which had been dropped into the tank at an earlier stage, no clue could be obtained as to where the leakage was

Fig. 5.

taking place. The bottom was cleared, and the lifts of the holder raised so that the tank wall could be examined; but, beyond a few fine cracks, there was nothing seriously wrong with it. These cracks were subsequently grouted with cement, and pointed-up. The puddle on the bottom of the tank was examined, and it was found that a considerable portion of it had lost its nature, being short and sandy. On excavating in the bottom, the puddle was found to be about 2 ft. thick, and to be lying in one place on a bed of sandy soil, and in another on running sand into which a rod could be driven-down 3 or 4 ft. without effort. Further investigation showed that several of the rest blocks, of which there were fifteen (fig. 6), had tilted forward towards the centre of the tank, and had broken-away from their connection to the tank wall—due, no doubt, to the additional weight of the two extra lifts which had been added to the holder, and especially to that of the fourth lift acting on a bracket extension of the original block. It was now fairly evident that leakage from the tank had occurred where these rest blocks had failed, allowing the water to percolate through the puddle to the sandy bed below.

It was decided to remove all the old rest blocks and also the top 12 in. of the existing puddle, and to form a continuous reinforced concrete toe to the wall, 7 ft. wide by 13 in. thick,

laid on the lower half of the old puddle which had been previously cut, turned, and rammed to a depth of 11 in. On this toe were constructed 24 new rest blocks in brickwork, 5 ft. 6 in. long by 18 in. wide, and now long enough to take the four lifts of the holder. On top of each of these blocks were laid two 5-in. by 1-in. flats, side by side, bedded in cement. The old puddle removed was re-laid over the bottom of the tank in the form of a flat cone of about 2 ft. rise, and on it was placed a layer of entirely new first-class puddle 12 in. thick, covering the whole of the bottom and finishing to the upper level of the concrete toe. This done, the tank was refilled with water and was found tight, in which condition it has since remained—a period now extending to about thirteen years.

In considering the above case, there is no evidence that subsidence was directly responsible for the damage; but there is the tilt of the tank for which to account, and also the fact of the presence of cracks, obviously due to ground movement, in surrounding buildings.

The last case is by far the most serious one with which the writer has been connected, and concerns a tank (fig. 7), 153 ft. 3 in. in diameter by 32 ft. deep, constructed thirty years ago. It is a brick tank and, except for the top 6 ft., which is supported by earthwork, is entirely sunk in the ground, which consists of boulder-clay. The back of the tank is puddled, and the truncated coned bottom is formed in the natural clay, which had merely been trimmed after excavation. It contains a three-lift frame-guided holder with untrussed crown and timber rest

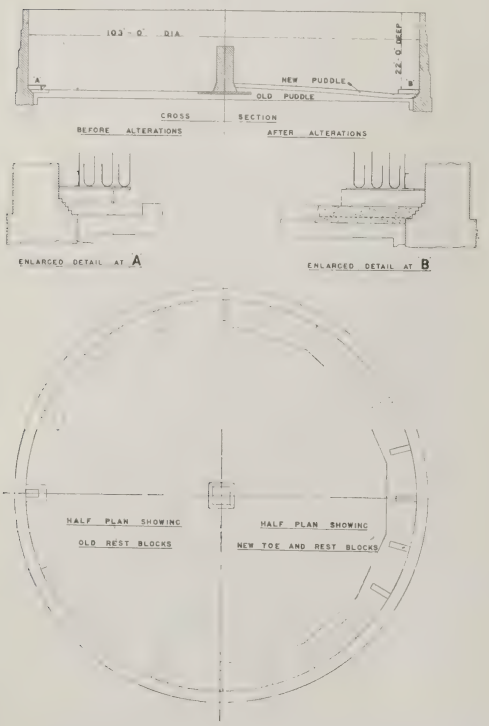


Fig. 6.

framing fixed in the tank. The capacity of the holder is $1\frac{1}{2}$ million c.ft.

Some twelve or thirteen years ago the appearance of sundry small cracks was noticed in buildings in the works adjacent to this tank. Test pats formed of a mixture of cement and plaster of Paris were applied to them, which on inspection from time to time indicated that some serious subsidence was developing. A general inspection of the works was made, and it was then found that this tank was $2\frac{3}{4}$ in. out of level. Two years after the discovery of the cracks, the event, of which the following is a chronicle, took place.

The gasholder attendant early one morning noticed that gas was blowing from under the bottom curb before the holder was quite full. On making an inspection, he found that the water in the tank was down about 3 ft. below the coping. He thereupon turned on a hose-pipe from a neighbouring fire hydrant, and left the water running into the tank. Shortly after, with a foreman, he again visited the tank, and found that, in spite of the hose-pipe running full, the tank was still losing water.

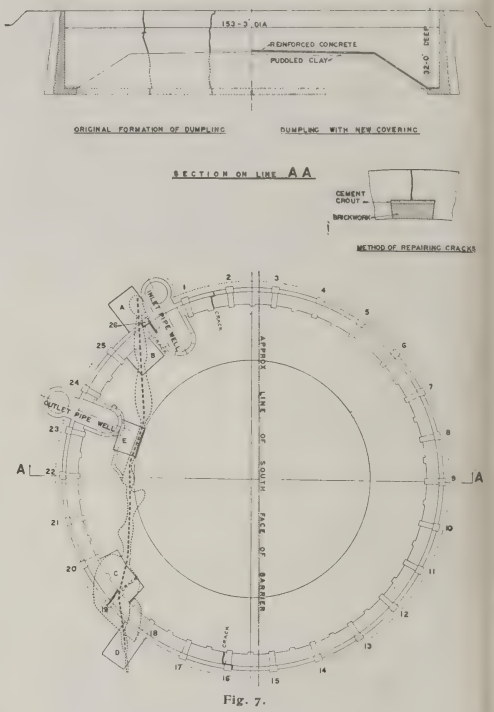


Fig. 7.

It was now recognized that the situation was serious; and the holder being practically full at the time, as much as possible of the gas was transferred to other holders until they were full. Some two hours after the loss of water was first noticed, the level had fallen 4 ft. 6 in. below the coping; and it was then decided, as the wind was favourable, that the gas should be liberated from the holder by loosening the manhole covers on the crown. Shortly after this was done, the bottom lift grounded and the second and top lifts dropped 4 ft.—fortunately without serious result. Meanwhile the release of the gas was expedited; but unfortunately the wind had now changed, and was blowing the escaping gas in the direction of some cottages close by. It was therefore considered advisable to turn-out the tenants, and to extinguish all their fires and lights. By this time the second lift had grounded, leaving the top lift a drop of 7 ft. before it found the water. In doing so, it threw up a fringe of water round its periphery to a height of about 25 ft. (fig. 8). It was an awe-inspiring spectacle, but, to the great relief of everyone concerned, the drop occasioned no visible damage, nor was any material damage found afterwards. The loss of water went on at a decreasing speed owing to the reducing head in the tank, until thirty hours after it was first discovered the tank was completely empty—during which time $2\frac{1}{2}$ million gallons of water had disappeared into the earth.

As soon as possible, examination of the tank wall was made, and three vertical cracks were discovered between standards 1 and 2, at standard 26, and at standard 16, running from top to bottom—that at standard 26 being the largest (figs. 9 and 10). The cracks varied respectively from $\frac{1}{16}$ in. to $\frac{1}{2}$ in. in

Fig. 8.—Showing Fringe of Water round Holder.

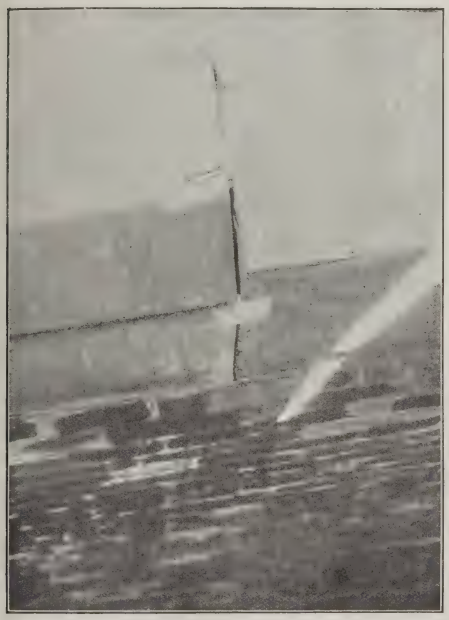


Fig. 9.—Crack in Tank Wall.

width. There was also a fourth crack at standard 19 running from the bottom to half-way up. All the cracks became somewhat larger as they approached the bottom. They also ran through the internal brick toe of the wall, which is 5 ft. wide and 2 ft. 6 in. thick, where they became wider still; and in the worst case, that at standard 26, the crack was $1\frac{1}{4}$ in. open at its maximum width (fig. 11). No fissure could be found in the dumpling; but the clay on its surface was in an extremely plastic condition. The conclusion was therefore come to that, if any fissure had developed, it might have closed again as soon as the water had run out. Of the test pats re-applied to cracks in the neighbouring buildings a few months earlier, it was found that 50 p.ct. of them had broken.

On removing the clay in the bottom of the tank in front of the toe of the wall at the points where the cracks occurred, an aperture was found at standard 26, which, when followed-up,

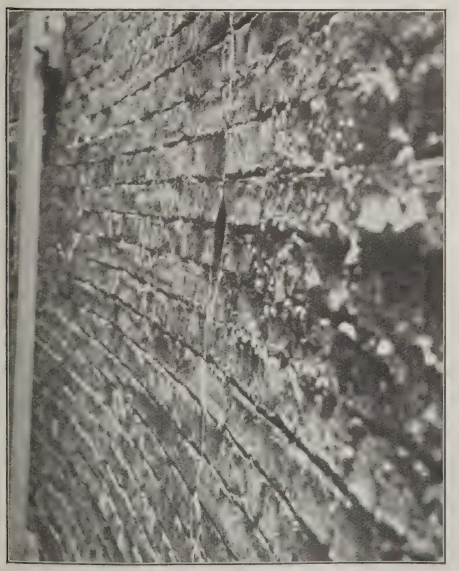


Fig. 10.—Crack in Tank Wall.

apparently led to some considerable cavity behind the wall, since when a hose-pipe was turned into this opening the water ran away as fast as it could be put in, and a sound was heard of water falling into some subterranean chamber. It was now evident that it was at this point that the bulk of the water had escaped; and the excavation was carried further, exposing a cavity leading from the inside of the tank back under the tank wall, a distance of about 18 ft. (fig. 12). It was therefore decided to sink an exploration shaft A immediately outside the tank wall down to the cavity, the floor of which was found to be 44 ft. below the coping. On exploring the cavity, it was discovered that it communicated with a second cavity running back again under the tank wall and under the dumpling, a distance of about 20 ft. This cavity was 4 ft. to 5 ft. wide and 3 ft. to 4 ft. high, and dipped rapidly towards its farther end. Another shaft B was sunk inside the tank immediately over this second cavity, opening it up. When this was done, an opening was found leading into yet another cavity extending under the dumpling for a distance of some 24 ft. It was 5 ft. or 6 ft. wide and of uncertain height, possibly 8 ft. or 10 ft. The floor was found to be limestone marl, and was heaped-up with a dome-shaped mass of clay which had fallen from its roof. It was now apparent from these explorations that the leakage was due to the water

Fig. 11.—Crack in Toe of Wall.

forcing itself through the crack in the toe of the wall at standard 26, and boring its way through the boulder clay to a fissure in the marl beneath, and that the rush of water had washed-out the softer portions of the clay and carried them away, thus forming the cavities described. A bore hole was sunk in the bottom of shaft A, when it was found that the boulder-clay extended to a depth of 54 ft. from the tank coping, below which lay the marl; limestone being struck at 81 ft. 6 in. Water was found standing at 69 ft. Another bore hole was sunk on the opposite side of the tank at a convenient point some little distance away, which showed boulder-clay to a depth of 53 ft., when marl was struck. The bore hole was continued to a total depth of 95 ft., but still showed marl; and water was found at 74 ft.

It was decided to drift through from one cavity to another, removing all the loose clay, and to put a stopper of concrete in the far outlet of the third cavity where it had reached the marl, then to fill up the whole of the cavities, drifts, and shaft B with weak concrete. The process was analogous to that of a dentist at work on a decayed tooth, when he first drills away the unsound material and then fills-in with a suitable stopping. The clay surface of the dumpling was removed over the whole of its area to a depth of 12 in., worked up as puddle, and replaced. The cracks in the toe of the wall were cut-out as far as necessary, grouted up with cement, and the brickwork made good. The vertical cracks in the wall were treated in the following manner (fig. 7). The wall was cut out for a distance of 6 in. or 8 in. on each side of the crack, and to a depth of 11 in., thus forming a more or less vertical chase about 14 in. wide by 11 in. deep. The front of the chase was filled up with 9-in. brickwork in cement; the joint with the old work being dove-tailed, leaving a cavity 2 in. wide at the back of the new brickwork. This cavity was run-in solid with

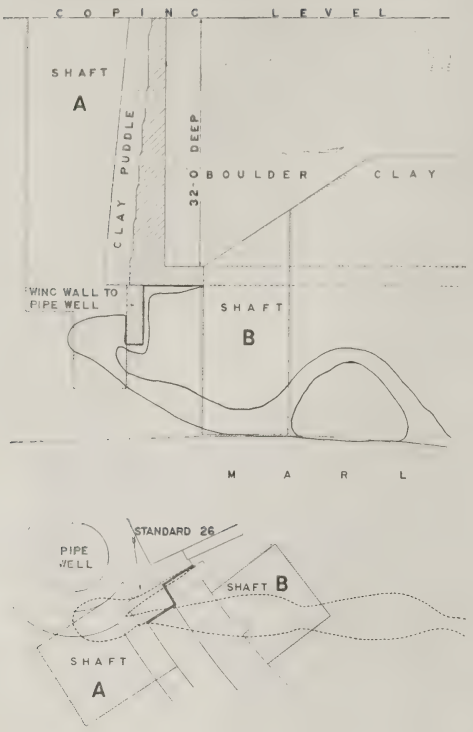


Fig. 12.

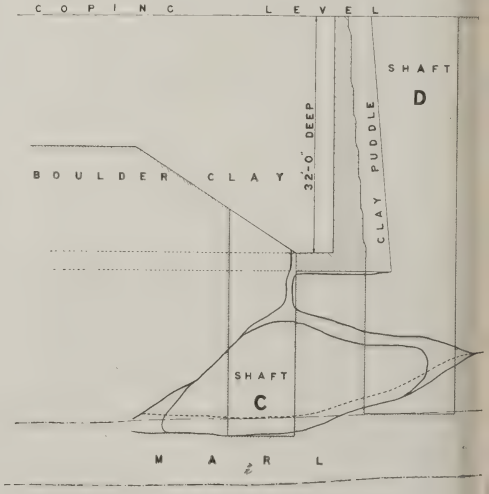
cement grout as the work went on. In the case of the worst crack—that at standard 26, and which was accessible at the back from the shaft A—cramps of flat steel, 3 in. by ¾ in., were built into the wall at vertical heights of about 3 ft. 6 in. The excavation under the wall and the bottom of shaft A was filled-in solid with strong concrete, the puddle backing was replaced, and the ground behind it filled-in and made good.

After these repairs, which occupied six months, were completed, the tank was filled with water up to within 2 ft. of the coping, when it was discovered that there was a slight leak amounting to about 1¼ in. in two hours. During the next four hours the loss increased to 16 in.; and within 36 hours of the filling, the whole of the contents of the tank had again disappeared. While the water was falling, small corks were dropped into the tank at various points, with a view to obtaining information as to what had occurred. The interior was inspected, and there was no difficulty in locating the seat of the trouble, which now appeared at standard 19 (fig. 13), and took the form of a fissure 3 ft. 3 in. by 4 in. wide in the clay bottom of the tank close up against the toe of the wall where it had been cracked. There were also two smaller holes in the bottom a few feet away from the fissure, each of which communicated with the larger opening. On following-up the fissure, it was found to communicate with a cavity very similar in character to those at standard 26, but larger, as it measured approximately 13 ft. in length by 7 ft. in width. The floor of this cavity was about 44 ft. below the coping. It apparently extended still further at a lower level, running both outwards under the tank wall and inwards under the dumpling; and it was now clear that the cavity lay more or less on the line joining up the cracks in the wall at standards 19 and 26, and that—a matter of very great interest—this line was approximately parallel to what had been ascertained to be one face of the barrier between two adjacent collieries. A shaft C was sunk inside the tank over the cavity, and carried down for a depth of 57 ft. below the coping into the marl, when a distinct fissure was discovered, into which an iron bar could easily be pushed down 4 or 5 ft. This fissure took approximately the same line as that of the cavity. A fourth shaft D was sunk outside the tank wall, and a drift carried through under the wall to shaft C. All loose clay was removed, and, as in the previous case, the wall was underpinned with strong concrete, and the cavities and shaft C filled in with a weaker mixture. In shaft D the puddle backing was replaced, and the ground filled-in solid behind.

A curious circumstance was noticed when excavating at the bottom of shaft D. The entrance to a small fissure in the clay was discovered; and on inserting a lighted candle to obtain a view of the interior, the flame became extinguished, though no draught was perceptible. This was due to the presence of CO_2 gas—a fact which was verified in the laboratory. The test was repeated on other occasions with the same result. In time, the supply of CO_2 exhausted itself. At a later period, but from another small fissure, a hissing sound was heard, which proved to be air under a slight pressure sufficient to blow out a candle. The following day, instead of the pressure there was an indrawing of the air which sucked-in the candle flame. On later occasions it was found there was sometimes a pressure and sometimes a suction of air at the orifice; but no exact record was kept of the periods of alternation. One conclusion drawn from these observations was that the changes in the flow of air might be due to the ventilating arrangements in the pit below. While exploring at the bottom of this shaft, one of the corks, which had been previously thrown into the tank while the water was falling, was discovered embedded in the soft clay at one side of the cavity.

After the repairs were completed—and they took about ten weeks to carry out—the tank was gradually filled with water for the second time, until a level of 16 in. below the coping was reached, when the water was shut-off. It was naturally hoped that the tank would now be found tight, but measurements showed that there was an average loss over the first three days of about ⅜ in. per day. Next day the loss had increased to 22 in., and the day after the water was down between 13 ft. and 14 ft. below the coping, and it continued to run out until there was only 5 ft. depth of water left in the tank. On inspecting the interior of the tank, an oval hole approximately 3 ft. long by 18 in. wide was discovered in the sloping side of the dumpling (fig. 14) leading more or less downwards into the interior of the ground; and the water was seen to be just trickling over the lip of the hole. This hole apparently led in a direction which would pick-up the line of fissure ascertained from the previous explorations. A shaft E was sunk in the dumpling at a point where it was expected the hole joined the fissure; and a cavity was found which on being followed led, as had been anticipated, in either direction in the line of the fissure in the marl. Drifts were carried in both directions—that is, to standards 26 and 19—until the concrete stoppings previously mentioned were picked-up. These drifts and the shaft were then filled-up with concrete as before.

It was now considered that the time had arrived for the



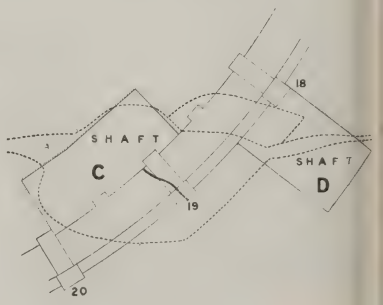


Fig. 13.

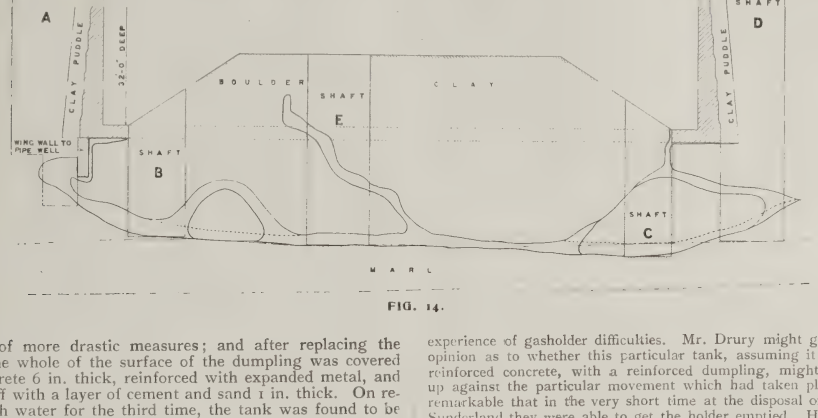


FIG. 14.

adoption of more drastic measures; and after replacing the puddle, the whole of the surface of the dumpling was covered with concrete 6 in. thick, reinforced with expanded metal, and finished-off with a layer of cement and sand 1 in. thick. On refilling with water for the third time, the tank was found to be bottle-tight; and after nine years it still remains so.

From the plan (fig. 7) it will be evident that the cause of the accident to the tank was the breaking of its back through unequal subsidence, due to the fact that one face of the barrier between two neighbouring collieries ran diametrically under it. This unequal subsidence had produced a fissure in the limestone marl, and had probably disturbed the overlying boulder-clay, thus permitting the water in the tank, under its full head, to bore its way through the clay, and disappear in the marl.

Discussion.

The CHAIRMAN, in opening the discussion, said Mr. Drury's paper was one of those contributions upon which the ordinary form of discussion was hardly possible; but it was a matter of interesting experience which was distinctly informative to them as engineers. It was a very valuable thing to have such an experience recorded in such detail for the guidance of any who might on future occasions have similar trouble to face. The last example of the author's difficulties was so outstanding as to overshadow the rest. They were indebted to him for recording it so carefully and describing it so fully.

Mr. W. W. ATLEY (Stockton) congratulated Mr. Drury on the way he had tackled the gasholder tanks. The last case described was a most extraordinary one, and he (the speaker) was very glad that he was not the responsible engineer who had had to undertake the work. Mr. Drury must be congratulated on the excellent way in which he carried out the repairs. He would like to ask Mr. Drury what he did with the holder during the period he was dealing with the repairs.

Mr. F. H. ROBINSON (Harrogate) asked whether the tanks were constructed before the colliery workings approached them. If they were constructed after the workings came near the tanks, then it seemed to suggest that the design was weak, in view of the local conditions.

Mr. A. C. HOVEY (London) said the general public possibly regarded gas manufacture as a mysterious process, and the life of a gas engineer as of a somewhat prosaic character. Mr. Drury's experiences in connection with gasholder tanks, which he had narrated to them that day, proved, however, that there were frequently both romance and adventure in this occupation. He wished to associate himself with the expressions of appreciation from other speakers of the courage and persevering skill which Mr. Drury had exhibited in dealing with important and difficult problems. The success which ultimately attended his undaunted efforts in the renovation of the large gasholder tank was particularly commendable, and the description was a valuable contribution to the proceedings of the Association, and worthy of the notice of gas and civil engineers throughout the world. In designing a gasholder, and concrete tank of similar size, he (Mr. Hovey) had arranged a concrete covering over the surface of the tank dumpling, though the subsoil was boulder clay; and he suggested that, if such covering had been incorporated with the toe of the wall of the Sunderland tank, the water would not have leaked out. He presumed that as boulder clay was such suitable material in which to construct a gasholder tank, the concrete covering of the dumpling had been omitted as a matter of economy. Where mining operations were in the neighbourhood, and the subsoil within the area did not vary greatly across it, a steel tank was probably the best, though there was a limit to the size. Mr. Drury had doubtless carefully examined the law in relation to the prevention of a colliery company approaching underground the site of a gas-works, and the liability involved. Any information on this would be interesting.

Mr. F. P. TARRATT (Newcastle) said he had had an opportunity of inspecting the particular tank referred to, and of going down the shafts. The conditions were not altogether pleasing; and one never knew what difficulties one was up against. So far as the construction of the tank was concerned, it was one of the best gasholders he had seen. The trouble arose through subsidence. The systematic way in which Mr. Drury persevered in tracking the source of the trouble until he eventually discovered the third leakage on the dumpling was most praiseworthy. It was a great anxiety to Mr. Drury, for he was without the use of the gasholder for 2½ years.

Mr. F. C. WILLIS (Tynemouth) said Mr. Drury had had a unique experience of gasholder difficulties. Mr. Drury might give them his opinion as to whether this particular tank, assuming it had been of reinforced concrete, with a reinforced dumpling, might have stood up against the particular movement which had taken place. It was remarkable that in the very short time at the disposal of the staff at Sunderland they were able to get the holder emptied. He would like to ask if there was any apparent strain in the standards or the diagonal bracings at standards 19 and 26. The circumstances seemed to point to the great importance of avoiding the erection of holders of that size too close to other holders. When Mr. Drury referred to the loss of water—something like 2¾ million gallons disappearing in 30 hours—it occurred to him (the speaker) that surely there must have been evidence of this water in another place. Mr. Drury was to be congratulated on his determination, amid great trials, and upon the successful way in which he overcame his difficulties.

Mr. DRURY, replying to the discussion, said it was very flattering to find that his paper had met with so kind a reception. He had not been responsible for the construction of the tanks, except one; they were built before he had anything to do with them. Though he had not named the locations of any of the tanks, it was obvious that the larger one belonged to Sunderland. He would like to say that he had the great advantage, in dealing with the collapse of the tank, of having an eminent Engineer as one of his Directors; and to him he (Mr. Drury) wished to acknowledge his obligation for the great assistance and support he received in carrying out what was an extremely heavy job. He had been asked what he did while the holder was under repair. He had done nothing. They left it on the rest blocks. As to the nearness of colliery workings, in some cases the tanks were constructed after colliery workings, and sometimes before the workings got near. The colliery workings were in the neighbourhood; but no doubt they gradually approached nearer the tanks until the subsidence occurred. A reference had been made to the romance of the gas engineer's life. It certainly was an interesting occupation. One found new problems every day; but he would not like to look forward to an experience similar to that which he had described in his paper. As to how far the law allowed colliery workings to approach gasholders, it was not for him to define the law at that juncture. There was a Parliamentary Inquiry being held regarding the effect of subsidence on property generally; and it had been sitting for about eighteen months. It would be best to await their report. The tanks were built partly on the barrier or boundary of two collieries, and the subsidence was more general in the case of the large tank. The boulder clay was bottle-dry, and thus the engineer would conclude he was quite safe. There was no apparent strain on standards Nos. 19 and 26. As to the steel tank to be relevelled on its foundations, this was not yet an accomplished fact, but they did not anticipate any serious trouble. Respecting the loss of 2½ million gallons of water, they made inquiries in all directions, to try to trace it; but they never heard of an influx anywhere. They might assume that it caused some disturbance somewhere, but they never heard of it.

Mr. W. M. GALLEWAY (Whitby) followed with a paper on "Income-Tax Allowances for Wear and Tear of Gas-Works Plant." [This is held-over until next week.] Thereafter

Mr. RIDLEY moved a vote of thanks to the readers of the papers. This was seconded by Mr. I. SPENCER (Seaham Harbour), and supported by the PRESIDENT.

OFFICERS FOR THE ENSUING YEAR.

The election of officers for the ensuing year resulted as follows:

President.—Mr. W. W. Atley, Stockton.

Vice-President.—Mr. Herbert Lees, Hexham.

Committee.—Mr. D. Currie, South Shields; Mr. C. Dru Drury, Sunderland; and Mr. F. P. Tarratt, Newcastle.

Hon. Secretary and Treasurer (re-elected).—Mr. Norman S. Cox, Sunderland.

Hon. Auditor (re-elected).—Mr. Charles H. Armstrong, Newcastle.

It was agreed, on the invitation of Mr. Atley, to hold the October meeting of the Association at Stockton.

Votes of thanks were accorded to the retiring President, the Committee, the Secretary and Treasurer, and the Auditor.

"B.C.G.A." NORTH WALES AND CHESHIRE DISTRICT CONFERENCE.

A GOOD GATHERING AT CHESTER.

It was a wise decision to select the beautiful City of Chester, which possesses so many advantages for such a gathering—high among which must be placed its progressive Gas Company—for the purpose of a British Commercial Gas Association North Wales and Cheshire District Conference. This was held last Wednesday, when a full programme attracted a good attendance of neighbouring gas men, as well as, at the afternoon session, of the general public. To those acquainted with the lines on which the Chester United Gas Company is worked, it is unnecessary to say that nothing was left undone to make the conference a success. The President was Alderman Sir John M. Frost, J.P. (the Chairman of the Company); and both he and Mr. F. A. Pye (the Secretary and General Manager) did everything in their power to assure a pleasant and profitable day. The Mayor (Alderman David Lythall Hewitt, J.P.) also devoted much of his busy day to the meeting.

The conference was held in the Assembly Rooms, Newgate Street; and at the opening of the proceedings the President introduced the Mayor.

The Mayor offered the delegates a hearty welcome to the ancient and beautiful city, and in his remarks gave expression to broad-minded views, which were much appreciated, on the subject of gas and electricity. While naturally proud of the city's electrical installation, he said he could not help being struck by the soundness of the present achievements and future possibilities of gas.

The President's Remarks.

Sir John Frost, having thanked the Mayor for his welcome, said that the easy-going character which was sometimes associated with cathedral cities did not apply to Chester. So long ago as in 1817 a company was formed in Chester to supply gas for illumination, and in 1818 a part of the centre of the city was first lighted with gas. Toll bridges were "freed" quite early in Chester. Electric light was introduced by municipal enterprise in 1897; electric trams followed soon afterwards; so, broadly speaking, ancient Chester had placed itself well in the van, rather than the rearguard, of modern developments and improvements. Gas had been supplied continuously since 1818; and his Company were among the original ones who assisted in the inauguration of the Association whose development they had met that day to encourage. The North Wales district was more difficult to organize than compact areas like the Midlands or Lancashire and Yorkshire; and they were therefore pleased to comply with the request to hold this conference in Chester, and cover a wider area, so that a larger programme could be arranged. The industry they represented was one of those of which they were justly proud. It was based on coal—the nation's most valuable asset—and in their methods none of the innumerable valuable constituents was destroyed or wasted. With the exception of modern coke-oven plants, there was no other method of dealing with coal so advantageously from the point of view of economy of the country's resources. This being the case, it was the more justifiable to organize a competent body to bring the advantages of gas systematically and insistently before the public. The British Commercial Gas Association was formed for this purpose, and they wanted every undertaking in the country—municipally or privately owned—to be affiliated with it. The smaller the works, the greater the relative value, because the advice given by the officials of the Association was that given by men of far greater and wider experience than such small works could hope to command with their limited financial means. The industry's general organization was on sound lines.

He would like for a moment to refer to the present industrial situation, which they all knew was deplorable. It was the aftermath of the war, and also the aftermath of post-war agreements and disagreements. But this was not all. During the war attention was absorbed by the war itself; and, as it pursued its weary course, there developed a tendency to forget the trend of industrial development immediately prior to the war. The fact was that this country's prosperity was built-up in the early part of the nineteenth century by the pioneer efforts of British manufacturers. Following this beginning, they knew that in a large degree nearly all countries came to this one to learn how to manufacture; and the competition in trade was being felt most seriously in this country, although in a varying degree, in pre-war days. Now the people of this country were in the position that, (1) being British, they wanted to pay their debts and were doing so; (2) owing to the waste of war the world demand for goods was reduced, on account of its inability to pay for them; and (3) other countries, equally well equipped with machinery, were in a position to quote for what demand existed at a lower price than that at which this country could economically produce, because they were not paying their debts, and labourers took lower wages and worked longer hours. The result of all this was naturally a feeling of disquietude and unrest; and proposals of all kinds were being made. There was some suggestion afloat—with what authority he did not know—to the effect that some £50,000,000 should be voted to the development of electrical super-power stations. That was one of the principal panaceas to encourage industry at the present moment, and, at the same time, to bring such amenities to life in the agricultural districts as would not only check the old-time constant flow of labour from agricultural to urban districts, but would actually attract the unemployed artisan into agriculture. Well, if such an ideal were feasible, he asked how far would £50,000,000 go. In saying this, he did not wish to deprecate the use of electricity in many branches of private and commercial life. He believed they would agree with him that, as in the past so in the future, private enterprise had got to remain the sound source of national prosperity. The gas industry in this country had developed to the highest efficiency in the world, without State aid; and so had all the other foundation industries of the country.

Mr. J. H. Crowther (Wallasey) proposed a vote of thanks to the Mayor and the President for their remarks. Referring to the competition of electricity, he said that, with a charge of (say) 6d. a unit for lighting and 1d. for cooking, people thought there must be a bargain in the latter; whereas, as a matter of fact, those present knew that what was being offered by electricity for 1d. for cooking could be supplied by gas at one-third of a penny. Both industries should be worked on commercial lines. As to the future of gas, companies had advantages which municipalities did not possess. Gas companies could extend their operations over a wider area; and he thought that, as time went on, this would be done more and more. Smaller works would be united with bigger ones, with beneficial results alike to the consumers and to those who had invested their money in the undertakings.

Mr. G. S. Frith (Runcorn), seconding, remarked that he happened to live in a district where there was a super-power station, and in a few weeks he believed they would be connected-up with 110 miles of continuous overhead wires; but with all this competition, and current down to 4d., the gas undertaking was still extending its business. He did not see that they need be afraid of healthy competition. With care and perseverance, he believed the gas consumption per house could be trebled. The name of Frost had always in his mind been coupled with the Chester Gas Company, and he hoped it would remain so for many years to come.

The President, in acknowledgment, agreed that there were great uses for both electricity and gas; and the two should work harmoniously together. So far as his Company were concerned, the output of gas grew year by year, and he saw no reason to anticipate any alteration in this respect.

The Association.

Mr. W. M. Mason (the Manager of the "B.C.G.A.") then made a statement with regard to the work and policy of the Association, now and in the future. He felt sure all present would agree with him that one of the most useful things the Association had accomplished for the gas industry was to provide a platform for men such as they had with them that day. It was an added strength to the whole gas industry that they got administrators like Sir John Frost and public men like the Mayor of Chester to co-operate with them, not in a controversial sense, but in a harmonious way. Some people might wonder what was the use of having so many meetings; but the one thing that had to be remembered was that, while some of them knew the story from beginning to end, there were others who had still to learn a good deal about the matter. Really the main object of the Association was the education of the public by propaganda; the two great obstacles to progress that had to be overcome were prejudice and ignorance. One of the biggest things the Association had done was to convert the medical profession very largely to a favourable view of gas as a hygienic fuel. This was an example of overcoming prejudice. For the removal of ignorance, they made extensive use of the Press. The Association now embraced 92 p.ct. of the make of gas; but on a numerical basis, the 800 undertakings who subscribed represented only about 50 p.ct., though this included practically all the large concerns. Undertakings who were slack at present in this respect would suffer for it in the future. If the work of the National Association in letting the country know what the industry stood for and what it could do ceased to-morrow, the effect might not be immediately notice-

able, but some day it would be found that gas undertakings were being left behind. They must recognize the necessity for educating the modern public to the advantages of gas. It paid to advertise, if the product was right, if the service was right, and if the advertising was right. This was proved by the way in which the gas industry was going ahead, in spite of strenuous competition.

NATIONAL ECONOMY IN THE USE OF COAL.

Mr. Owen Evans (Engineer and Manager of the Wrexham Gas Company) read a paper in which he dealt with the vital question of coal conservation. It was pointed out by him that the past industrial and commercial greatness of Great Britain has been mostly due to the possession of an abundant supply of cheap coal; and her immediate and future prosperity will undoubtedly continue to depend upon this our great industrial asset. Careful conservation is absolutely essential. The Coal Conservation Committee presided over by Lord Haldane, who reported in 1918, favoured the erection of large central or "super" stations for the generation of electricity, using coal-fired steam turbines, and claimed, by comparing such a scheme with the wastefulness of the small isolated steam engines in very common use, that the coal consumption for power-production purposes could be reduced from 5 lbs. to 1 lb. per H.P.-hour, and thus effect a saving of 55 million tons of coal per annum for present power requirements. If this were true, nothing could be more desirable; but unfortunately the Committee's findings were based upon many fallacious assumptions, which have been dealt with fully by Sir Dugald Clerk, F.R.S.

The facts revealed by Sir Dugald Clerk, indeed, put a very different complexion upon the matter. They showed that, while the generation of electricity at super-stations, with the estimated, but as yet unachieved, consumption of only 1 lb. of coal per electrical horse-power, would effect a marked economy in coal consumption in comparison with that ($2\frac{1}{2}$ lbs. per E.H.P.) at the average existing generating stations, and while it would therefore be a great advantage that all present and additional requirements of electrical energy for lighting or power purposes should be generated by plant so comparatively economical in coal consumption, the use as a source of heat of electrical energy generated from even such a reduced consumption of coal as that promised would be a grossly wasteful method of using our coal supplies. Sir Dugald gave authoritative—and startling—figures showing that, out of every 100 heat units contained in the coal consumed in the average generating station in this country, over 92 are absolutely lost to the community, and less than 8 reach the consumer as electrical energy; that in the best station to-day the waste is 88 p.ct.; and that in the proposed super-stations, if the hitherto unattained economy promised by the experts is reached, the waste will still be over 80 out of every 100 units.

If coal were used solely for power and lighting, a good case could be made out for its substitution by electricity, as electricity is an efficient and convenient means of transmitting power and producing light, and it is, of course, indispensable for electric railways. It must be remembered, however, that more than one-half of the coal consumed in this country is used for the production of heat; and the proposal to substitute electricity for coal for this purpose can only be accomplished at the cost of an enormous increase in the quantity of coal used. The only sure way to the conservation of coal lies in its scientific treatment; and in this respect the gas industry has always led the way.

Although the use of gas is increasing to an enormous extent for heating and cooking for domestic purposes, it is estimated that about 40 million tons of coal per annum are still supplied for these purposes in the raw state; and one may consider the result of substituting gas, which has now become a practical proposition. The average efficiency of gas in actual use for the customary domestic duties is well over 50 p.ct.; and if all the coal at present consumed for domestic purposes was carbonized at the gas-works, no more coal would have to be used, and there would be over 20 million tons of coke to spare, which could be utilized with efficiency, in displacement of coal, for various industrial purposes, for railway locomotives, and for the generation of electricity, &c. There would also be an enormous additional supply of the other bye-products. Or, alternatively, such is the flexibility of the gas-works method, the whole of the extra coke and tar produced could be gasified, and the coal used at the gas-works would be proportionately reduced. On the other hand, if the coal used for domestic purposes is to be substituted by electricity, as proposed under the super-station scheme, the quantity of coal required would be increased threefold—*i.e.*, to the enormous quantity of 120 million tons per annum.

In the industrial world the position is rather different, and the larger proportion of the coal used is for power purposes; but at the same time it must be borne in mind that many industries require a large quantity of heat, and a solution of the power problem from the point of view of coal conservation does not by any means solve the heating problem. It is estimated that 60 to 70 million tons of coal are employed annually for various industrial purposes; and if this was all used for the production of power, the claim that electricity could be substituted at a lower coal consumption would have some foundation. A still stronger claim could, however, be put forward on behalf of internal combustion engines, as the efficiency of such engines is exceedingly high, and the great advantage of gas power is that small units, such as 50 B.H.P., give efficiencies quite as high as those of the larger units of gas and super units of electricity.

Mr. David Brownlie estimates that, of the total quantity of coal used, from 20 to 30 p.ct.—probably some 20 million tons—is consumed annually in boiler furnaces, &c., to raise steam and provide heat for various manufacturing processes other than power. Many industries requiring both heat and power make use, generally in a most economical manner, of the waste steam of their steam-generating plants, and the exhaust gases of internal combustion engines, to provide the necessary heat. Great possibilities exist in this direction, and further developments on similar lines would be the means of a substantial saving in coal.

It is, the author went on, difficult to see upon what grounds the claim has been made that the use of electricity solely for all industrial purposes will assist in the conservation of coal; in fact, everything points to the contrary, and in the event of such a happening, there can be little doubt that it would result in the quantity of coal used being very considerably increased.

The concluding portion of the paper dealt with coke. Mr. Evans said that the use of coke for domestic purposes has not advanced as rapidly as desired; but if every effort is made by the gas undertakings of the country to draw public attention to its general usefulness and economy, a large quantity can be disposed of, to the interests of the consumers, the gas undertakings, and coal conservation.

Discussion.

The President voiced the thanks of the meeting to Mr. Mason and Mr. Evans.

Mr. J. Smith (Colwyn Bay) said the "B.C.G.A." were doing excellent national service. It needed driving home that, in the case of electricity supply, 92 p.ct. of the energy in the coal was wasted, and only 8 p.ct. could be delivered to the consumer. He pointed out that the crude oils derivable from tar offered great opportunities for Diesel engines. Some of his friends were obtaining excellent results in this way. Mr. Evans had made out a good case. They could generate a large percentage of the electricity at present consumed in the country by the products remaining after they had given the public a supply of good and cheap gas; and in view of the conservation of the coal resources, this was one of the points that they, as gas engineers and as representatives of the community, ought always to keep well before the public.

Mr. Crowther, referring to the work of the "B.C.G.A.," said he wondered sometimes whether they would not be justified in making comparisons with electricity—in saying in some of their advertisements what really could be done by the two competitors, gas and electricity, in different classes of work. They stated what could be done by gas, and it was a good story; but many people did not know what could not be done by electricity in the way of heating. As to Mr. Evans's paper, a gas-engine for super-power stations was not in the market. People were not going to take out small-sized steam engines and put in gas engines. He did not see how they could look forward to any good business from electricity works in the way of coke supply, when such works could buy slack containing practically the same B.Th.U. as did the coke. They would have to look more to the domestic market for sales of coke, if exports continued to fade away, and not expect electricity stations to purchase it.

Mr. Mason replied that Mr. Crowther's suggestion had been discussed very fully and very frequently by the "B.C.G.A." Executive. There were two main reasons why the Association had never had anything to do with controversial publicity. The first was that it was not good business; and the second was that so many municipalities who possessed both gas and electricity undertakings were members of the Association.

Mr. Evans said his argument was that if gas engines were used more for the generation of electricity, coal conservation would result. With regard to coke for boiler firing, there were places where slack was not easily procurable, and coke was being employed very economically. There were numerous instances of coke breeze and coal being used successfully on what was known as the "Sandwich" system.

Mr. Pye, speaking as Chairman of the North Wales Commercial Section, said the trouble in that district was that, owing to the scattered nature of the area, they did not get the support of some of the small undertakings. Such concerns should understand the great advantages they would derive from membership of the Association, when they had difficult problems to solve. They could then call upon men of the widest experience for assistance which would prove invaluable to them. Further, it was only by combination that the industry had been able to secure the satisfactory results which had been achieved so far. It was up to every one to support national organizations of this character; and he would like to urge the near neighbours of undertakings who were not members to use their personal influence to induce them to become so. It was hardly fair to accept advantages without contributing towards the cost.

Luncheon

In the Grosvenor Hotel, the visitors were the guests at luncheon of the Chairman and Directors of the Chester United Gas Company, with Sir John Frost in the chair. The toast of "The City of Chester" was proposed by Councillor Evans, of Wallasey; and the Mayor replied—saying that the best advertisement in the world for a gas company was a tactful and courteous body of assistants. This the Chester Gas Company certainly possessed. Mr. Mason, submitting "The Chair-

man and Directors of the Chester United Gas Company," said those present were under a deep debt of gratitude to them. The Chairman replied that it had given the Board great pleasure to welcome the "B.C.G.A." to Chester. The Company had experienced the benefits of the Association.

THE AFTERNOON SESSION.

In the afternoon there was a public conference—presided over, in the unavoidable absence of the President, by Councillor EVANS, who is Chairman of the Wallasey Gas Committee, and was Mayor of the borough last year.

Councillor EVANS said the question they had met to consider was "Public Health and Smoke Abatement." It had actually been calculated that the smoke from every ton of coal burned raw did about £1 worth of damage, which had to be paid for by the general public—whether as private individuals or as ratepayers, and including the patriotic and sensible people who did not make smoke. In effect, this meant that they allowed every raw-coal consumer to do pounds worth of unnecessary damage free of charge. This was not fair, and could not in the long run do anybody any good. Even in Chester they might perhaps learn something from the larger experience of London. In London the soot fall—which was a fair measure of the smoke curse—had been almost halved in the last twelve years. Why? Because, as Dr. Howarth, Medical Officer of Health for the City of London, said in an official report issued only last Monday, more people were using gas—and to a lesser extent electricity also (a lesser extent, because electricity was too costly) for heating, cooking, and water heating. The gas industry provided a means of diminishing, and eventually abolishing altogether, the serious damage done by smoke. They wanted the public to know two things—first, how appalling and costly this damage was; and, secondly, that gas could put an end to it with positive direct advantages to those who used it instead of burning coal.

SMOKE AND THE PUBLIC HEALTH.

Mr. D. RENNET, M.B.E., M.D., D.P.H. (Medical Officer of Health to the City and County Borough of Chester) addressed the conference on "Smoke and the Public Health." He said it is only comparatively recently that the full benefits of the radiant energy of the sun have been appreciated. It is now known that exposure to sunlight has in very many conditions curative effects which are little short of marvellous. In some conditions the sun has taken the place of the surgeon; and if it operates at a more leisurely rate, the finished result is infinitely superior. Exposure to sunlight acts beneficially on the whole organism, not merely on diseased conditions. Blood has the power of absorbing a certain energy from the sun's rays, and carrying it to every tissue and organ of the body, to their great advantage. Some of the most active rays of sunlight are absorbed in the atmosphere much more readily than others; and as they are originally present in comparatively small amounts, very little obstruction to sunlight by the presence of smoke in the air cuts-off these most active rays. With even a slightly smoky atmosphere, people are deprived of the most beneficial and curative rays of the solar spectrum.

What remedies can one suggest for the mitigation of domestic smoke? Apart from cooking and the provision of hot water, a fire is necessary for comfort during many months of the year. Comfort, however, does not mean a large fire, nor does it necessarily mean a coal fire. But there are serious disadvantages to both the alternatives, gas fires or electric fires. Each is too expensive for constant use; but both eliminate smoke. Apart from expense, it is doubtful if the ordinary citizen will consent to spend the evening by a gas or electric fire. There remains the remedy of a smokeless fuel, which I would commend to the fuel experts. For cooking and for occasional fires for comfort, both gas and electricity are better than coal. With each the temperature can be controlled at will with a minimum of trouble. For some cooking purposes Dr. Rennet considers electricity better than gas, while for others gas has the advantage. For the supply of hot water gas is a practical possibility; but the smokeless fuel would solve that problem in solving the problem of the ordinary domestic fire. For the occasional fire there is nothing better and more convenient than either an electric or gas radiator, with the economic advantage in favour of gas. In any case, for the sake of healthy living, whatever means may be employed, burn less coal.

THE GAS INDUSTRY'S HELP.

Mr. HAROLD HARTLEY, D.Sc., followed this up by a lecture on "How the Gas Industry is Helping to Solve the Smoke Problem." In the course of this, he stated that, when compared with electrical energy on a common heat unit basis, the price of gas now ruling is equivalent to electrical energy at less than one halfpenny per unit. Electrical energy is energy in a form which we are capable of employing efficiently; but it is to be feared that the difficulties inherent in the conversion of coal into electrical energy, which are such that the average efficiency of the country's power stations is less than 10 p.ct., will limit the use of electricity for heating purposes, for which over 50 p.ct. of our total coal consumption is employed. The coking industry, by its very nature, is in a much more favourable position; and of every 100 heat units in the coal carbonized in town's gas-works, some 75 to 80 heat units are available in the products—gas, coke, and tar. Of the two chief products of the gas-works, the coke represents some 50 p.ct. of the original heat units in the coal, whereas the gas itself represents only 25 p.ct. This is a point which is not always realized by the general public; and its greater appreciation would assist the crusade in which we are engaged. The replacement of coal by coke in boiler firing enables considerable savings to be effected. Whereas 150 p.ct. excess air is often employed with a smoky bituminous coal, coke fired under forced draught conditions requires only 50 p.ct. excess air. As to furnaces for continuous processes, where the furnace setting has to be heated-up and maintained for considerable periods, the coke-fired furnace of the self-contained producer type, with proper recuperative or regenerative systems, will be found most efficient and better for the production of reducing conditions than coal.

For many intermittent industrial processes town gas is ideal, and in this sphere can actually compete successfully with coke—even on the score of fuel consumption alone, leaving out of consideration the question of decreased labour charges and overhead charges resulting from the increased throughput of the gas-fired furnace. Two examples were cited—namely, annealing in a "Revergen" furnace, which can be carried out at a consumption of 3000 to 4000 c.ft. of 500 B.Th.U. gas per ton, and yellow brass melting in a gas-fired furnace provided with metal and air preheaters at a consumption of 2½ c.ft. per lb. on the basis of six melts daily.

As much as 6 p.ct. of the coal passed through domestic grates finds its way up the chimney as soot. The total waste of fuel in the open fireplace probably represents some 75 p.ct. of the coal used. It is computed that 35 to 40 million tons of coal are still burnt annually in domestic fires, despite the fact that during the last 22 years the sales of town gas have increased by 80 p.ct. The amount of energy placed at the disposal of the householder from the principal domestic fuels are:

			Relative Costs of Raw Fuel.
Coal at 50s. per ton	..	52,500 B.Th.U. per 1d.	.. 6·5
Coke at 50s. per ton	..	48,000 ,, ,,	.. 7·1
Gas at 9d. per therm	..	11,000 ,, ,,	.. 31·0
Electricity at 1d. per unit	..	3,400 ,, ,,	.. 100·0

Owing to the differences in the efficiency of the appliances in which the fuels are used, the variation in cost of the actual service rendered is not so great as might be concluded from the above table. For continuous use, the following relative efficiencies are obtained:

Electricity	100
Gas—in open fire	50
Gas—in flueless heater	31
Coke—in open grate	24
Coke—in closed stove	14
Coal—in open grate	26

Neglecting physiological factors, it will be seen that the cheapest means of warming a building is by the use of coke—for example, by central heating.

When we consider the question of intermittent heating, the position of gas and electricity is improved still further. When a room is required to be heated for a period not exceeding (say) three hours, the gas fire is as economical as the open coal fire. For shorter periods the gas fire is the cheaper, and is the most economical means available. Whether used for short or long periods, the relative costs of gas and electricity are as given above.

There is probably only one room in the majority of houses where heating is required continuously for a long period. In most of these cases a coke stove could be employed economically, with or without radiators in other parts of the building. The dining-room, sitting-room, and bedrooms could have, in addition, gas fires which, as an adjunct to a low-temperature central heating system producing an air temperature of about 55° Fahr., will be found economical.

The gas cooker, which has replaced the coal range in millions of cases, offers the cheapest and most convenient means of carrying-out domestic cooking, and is applicable to all classes. The best cooker of the present day will show a saving of from 25 to 33 p.ct. compared with those of the pre-war period. Further than this, steps have now been taken to render the operation of the oven entirely automatic; no attention being necessary with some ovens during the cooking period. Gas is alone at the present day in offering this convenience, and is cheap and economical. To cite one example, it is possible to bake six 2 lb. loaves for 1d., using gas at 10d. a therm. Even with electricity at 1d. per unit, it costs from two to three times as much to cook with electricity as with gas.

Coke-heated water circulators are now available in forms which enable the incandescent fire to be seen and used for room warming, and give cheap continuous service. By the use of a gas-heated geyser, which has an efficiency of well over 80 p.ct., and is one of the most efficient domestic appliances available, gas offers an alternative means of providing hot water for small property. In many of the recent housing schemes, geysers are being installed. Gas cookers are provided for the cooking, and a small open fire is fitted in the kitchen. In all other types of

house where there is an existing circulating system, the coke heater could be connected-up, or, alternatively, the gas circulator could be employed. The latter is more convenient than the solid fuel heater, and being provided with a thermostat it becomes automatic in its action. Compared with coke, however, the gas circulator is relatively expensive; and in order to cut down stand-by losses, the self-contained circulator and storage tank system has been developed, and has much widened the applicability of gas to this sphere.

Discussion.

The CHAIRMAN remarked that they had had two excellent lectures, each dealing with a different aspect of the one question.

Mr. CROWTHER said he could not conceive conditions under which cooking by electricity could be in any way superior to cooking carried out by gas. Neither could he imagine any housewife at the present time, who had gas available, seriously considering the alternative of cooking by means of solid fuel. He would like to suggest that, instead of looking to their gas undertakings to contribute something in aid of the rates, municipalities who owned them should give sums to their gas undertakings, to enable them to sell gas at a nominal price. ["Hear, hear."] What they lost in one way they would gain in another way—namely, in health. What means were they going to adopt to get the general public to take more interest in the work of the gas industry? They had the "B.C.G.A.," who were doing admirable work. Geysers were handy and efficient; but the circulator was very much more convenient, and was going to increase in popularity as time went by. One trouble at the present time was the first high cost, and some reduction would assist towards the more general adoption of this apparatus.

Councillor WRIGHT (Wallasey) pointed out that it was up to the industry to see that there were installed in houses only up-to-date appliances; otherwise the waste in gas and money would turn people away from doing what they wished them to do. They should try to put in cheaper gas fires, so as to forward the adoption of these appliances.

Mr. SMITH said that at Colwyn Bay they favoured the complete gas water circulator system, and it had been beneficial in increasing the use of gas for hot water work. Geysers called for an installation on generous lines—a large meter and a large supply pipe—and perfect ventilation; whereas with the circulator these things were not so necessary. With regard to central heating, he had put in from twenty to thirty installations, and had done it in such a manner as to secure a very good class of consumer, who was perfectly satisfied. His plan had been to bring the temperature of the premises up to a certain point, and then to reinforce this by gas fires in the rooms where extra heat was required. Mr. Crowther's suggestion for the subsidizing of gas undertakings, so as to aid the abolition of smoke, was an original one which might be followed up.

Mr. F. G. SKEMPSEY (Hoole, near Chester) remarked that Northampton had a very clean appearance, though it was a manufacturing town. The reason for this was that in practically the only industry there—boot making—gas engines were employed. Smoke emitted by locomotive engines was still one of the most prolific sources of trouble, and should be tackled. Again, he knew of a steam laundry which, from a chimney little higher than a cottage, was pouring forth a dense volume of smoke. How was it that such a thing was possible in these days? He was not aware how far it was a practical proposition that gas should be used in a steam laundry, but something should be done. Whatever might be the benefit of the present state of affairs to the proprietor, the damage to the community was probably twenty-five times as great.

Mr. TASKER (Hoole) urged that the use of gas would be on a much greater scale if the cost of appliances for consuming it were considerably reduced. However much they might advertise, unless the appliances were cheaper they would not progress greatly. The charges for installation should also be on the most reasonable basis possible. These suggestions were for the benefit of the sellers of gas and the makers of appliances intended for the use of gas.

Mr. WALTER HILTON (Chester) said he had found, working as an architect and building houses of a more or less similar type, that if one or two people could be induced to put in gas appliances, the rest would follow. ["Hear, hear."] This was the only practical way. He had found geysers with prepayment meters the best form of water heating. The way to get the general public to use gas appliances was to encourage those people who were building modern houses to instal them.

Mr. PYE said great strides had been made in the scientific development of gas fires. In the matter of smokeless fuel, he thought they were largely in the hands of the Fuel Research Board. At the moment, low-temperature carbonization was wasteful and impracticable for modern gas requirements, but he did not think it need always be so. Gas coke was, perhaps, now in not altogether the easiest form for the uninitiated public to use with complete comfort for domestic purposes, and developments might arise in the shape of an alteration in the temperature at which coal was carbonized so as to produce a fuel that would burn more readily in the open fire. He proposed a hearty vote of thanks to the two lecturers.

Mr. MASON seconded this vote, and included in it the Chairman and Directors of the Chester Gas Company, for their cordial welcome and generous hospitality, as well as Mr. Pye and his staff, who had worked so hard to make the conference a success. A great thing about the gas industry was that it ran parallel with the public good.

The CHAIRMAN remarked that in a bedroom with no fireplace he had put an electric radiator; but it gave off such a bad smell that he had to have it removed. The laundry to which reference had been made could get over the smoke difficulty by using coke; but there would then be less washing to do. [Laughter.]

Dr. RENNET, in acknowledgment, said he could not spend an evening by a gas fire or an electric radiator. In their isolation hospital they had installed electric cooking. After six months' experience of it, he had no hesitation in saying the oven work by electricity was superior to the oven work by gas. With the gas oven there was a constant stream of air from near the dusty floor passing over the meat; the electric oven was practically hermetically closed. For boiling, electricity was too slow.

Dr. HARTLEY said that, with regard to electric cooking, he could not agree with Dr. Rennet. As the result of full tests, he declared that if two joints of equal quality were cooked, one in a gas oven and the other in an electric oven, it would be impossible to detect any difference. Of course, if desired, one could procure gas ovens so made as to prevent the passage of air over the meat, to which Dr. Rennet had objected. Certainly the electric hotplate was slow in operation. It was not to the advantage of the apparatus manufacturers to make gas appliances that would not sell; and their aim was to render it possible for these appliances to do their work with the least practicable expenditure of gas. Consonant with making a sound article, the cost was kept as low as possible.

A GAS EXHIBITION.

The conference coincided with a week's gas exhibition in the same building, and during the day the visitors took the opportunity to inspect the display. It was an excellent little exhibition on the most practical lines; and when the writer looked in during the afternoon all the chairs were occupied by housewives who were listening to a cookery lecture and demonstration that were being given by Miss N. Longworth. There was, indeed, convincing proof of the success that attends efforts of this character to popularize still further the use of gas for cooking.

Four of the Radiation firms took part in the exhibition, there being two well-arranged stands on each side of the hall. On one side were Messrs. John Wright & Co. and Messrs. Fletcher, Russell & Co.; and on the other the Richmond Gas Stove and Meter Company and Messrs. Wilsons and Mathiesons. Samples of the latest types of cooker were on view, with details of the Gas Company's hire and purchase system, and in the centre of each stand was a handsome modern gas fire in appropriate surround. There was also a selection of water heaters, &c.

At one end of the hall was the lecture platform, provided by Messrs. W. Sugg & Co. with new pattern overhead lights fitted with enamelled adjustable reflectors arranged so as to throw the illumination in any required direction. At the other end was the stand of the Chester Gas Company, an interesting feature of which was an attractively set-out display of bye-products resulting from the manufacture of coal gas. "Vitreosil" heat-proof globes were there, with a demonstration of their effectiveness, by means of a stream of water playing on a heated globe. Another proof of the fact that these globes are as heat resisting as they are claimed to be was the exhibition of one which had been rescued from a fire at Prestatyn which had destroyed the gasfitting. The globe was discoloured; but the application of remedial measures to one side had shown that this discoloration was not permanent. A Sawer & Purves meter in glass case exposed what so many gas consumers still persist in regarding as a mystery; and near by was a new type of Sugg burner specially designed for use in mills, being fitted with a device for filtering the air before it passes into the mixing chamber.

The body of the hall was illuminated by a number of Sugg "Littleton" cluster lamps with distance control; and at the entrance were automatic devices drawing attention to the action of the Radiation patent injection-ventilator and to the way in which "New World" cookers control their own oven heat automatically.

Society of British Gas Industries.

A very interesting gathering was held at the Town Hall, Manchester, on Tuesday, April 28, on the occasion of the visit of the Council of the Society of British Gas Industries. An invitation to luncheon had been given to the Council by the Lord Mayor (Alderman Fred J. West, C.B.E.), one of the founders of the Society and a past Chairman. Unfortunately both the Chairman (Mr. J. Wilfrid Drake) and Vice-Chairman (Mr. B. B. Waller) were unavoidably absent. Mr. Frederick C. Tilley (a past Chairman), on behalf of the Council, thanked the Lord Mayor for his kind hospitality, and in a few well-chosen words proposed his health and wished him a successful year of office. The Lord Mayor expressed his pleasure at being able to entertain his old friends during his year of office. After the luncheon, the Lord Mayor adjourned with his friends to the smoke-room, where they spent a delightful hour.

London and Southern District Junior Gas Association.—The annual general business meeting of the Association will be held at the Westminster Technical Institute, Vincent Square, S.W. 1, on Friday next, May 8.

"B.C.G.A." West Riding Conference.—There is to be, on Thursday, May 21, a British Commercial Gas Association Manchester District (West Riding of Yorkshire Section) Conference, in the Harlow Manor Hydro, Harrogate, under the Presidency of Mr. Francis Barber, the Chairman of the Harrogate Gas Company. Luncheon with the Chairman and Directors of the Gas Company will precede the business, which will include an address on "Light and Health," by Mr. R. Veitch Clark, M.A., M.B. (Medical Officer of Health of the City of Manchester), and a paper entitled "Gas as a Public Service," by Mr. Frank H. Robinson, Assoc.M.Inst.C.E. (Engineer and Manager to the Harrogate Gas Company).

GAS FOR INDUSTRY.

The paper on this subject, by Mr. C. Bryan Donkin before the Eastern Counties Gas Managers' Association [*ante*, pp. 312-14], gave rise to the following

Discussion.

The President (Mr. F. A. West) thanked Mr. Donkin for his paper, which opened up a very wide field. There were unlimited possibilities of increasing their consumption in industrial work. Could the author give them any idea of the price at which coal gas should be sold for operating these furnaces to compete with ordinary producer gas, which was used in a good many furnaces in the industrial world? It was up to them to try to bring down their costs to compete with producer gas, which was possibly one of their greatest rivals at the moment.

Mr. W. H. Mainwaring (Lincoln) inquired whether producer gas could be used in the furnaces described.

Mr. W. T. Dunn (London) asked whether the author had had any experience in regard to the quality and nature of the refractory materials used in connection with the furnaces.

Mr. Thomas Glover (Norwich) said it would be interesting if they knew just how the economies referred to were effected. A certain amount of gas of a certain calorific value was consumed, but under different conditions it gave quite different results. The time factor was very important, in addition to the amount of gas consumed. He himself had had direct evidence in confirmation of what Mr. Donkin had claimed for the type-metal melting furnaces. In this case the burner originally supplied was very inefficient, and he put down the improvement that had been effected to the fact that the gas was combusted under better conditions—the intimate mixture of the gas and air brought about more perfect combustion, and allowed of more combustion in a given area. As a matter of fact, very often they did not know, when they were burning gas in large volume, how much was being wasted; and he supposed it was the elimination of this waste which enabled British Furnaces, with their better knowledge and the improved appliances that they had designed, to effect these economies. Now these economies were very important, because they might, in some circumstances, make all the difference in deciding whether it was possible to employ town gas for these industrial purposes. Town gas would be precluded if they could not show certain figures as compared with direct firing with coal or coke. One of the furnaces to which reference had been made was a galvanizing furnace. This process was at the present time largely carried out with coke—about which they had no complaint to make, as they were coke suppliers, though they might under some conditions be very glad to carry it out with gas. He had an inquiry at the moment as to whether it could be done with town gas, and he would be pleased to be able to answer in the affirmative. At the moment it seemed to him to be rather a hopeless proposition for gas; but Mr. Donkin's firm had brought the solution a great deal nearer by these more perfect appliances. He was very glad to know there were such appliances available, because in practically every town where there was a newspaper printed metal was melted on a fairly big scale; and it was certainly a very much nicer process when done by town gas than when firing by solid fuel was employed. If the paper served no other purpose than to draw attention to this one particular appliance, it would have been useful. Newspaper offices could be very good customers indeed, and with these improved burners they would be more likely to use gas and to turn-out solid fuel appliances.

GAS FOR BREAD BAKING.

Some of the furnaces shown would only be required in towns associated with special industries; but there was one industry which was carried on in every town, and that was bread baking. Were the firm doing anything in this direction?

Mr. W. W. Townsend (Colchester) asked how the inspirator worked. He gathered that alterations in the pressure of the gas supply would not make any difference, as there was a governor, and the air supply was at a definite pressure; but was there any compensation for alterations in the calorific value of the gas? He had had experience of one of the furnaces made by the author's firm in accordance with this principle, and the inspirator arrangement worked admirably; a temperature of 1400° C. being attained very rapidly. The only criticism he had to offer—and perhaps it was not quite a fair one—was that if one wanted any other temperature than that for which the furnace was designed, it was rather difficult to reduce very much below the stated figure. There was a certain limited range of adjustment. Of course, in converting people to gaseous firing, they had to deal with the relative costs of gas and competitive fuels; but there were other advantages which were generally sufficient to turn the scale in favour of gas. A works in his own town were taking up the welding of boiler tubes by means of gas. They found the fuel consumption with gas, as compared with coke, was considerably greater; but the whole of their boiler shop was being held up owing to the time taken in welding these tubes with solid fuel. Therefore they were planning to speed-up their boiler work by adopting gas, and were satisfied, after experience, that they could do it and save a great deal of money. But, of course, to obtain consumptions of this kind it was necessary to offer specially reduced rates, and this he was greatly in favour of doing. His Company were prepared to allow a very substantial rebate for a certain consumption; and he thought they were entirely justified in doing it, to secure this extra load.

Mr. R. G. Shadbolt (Birmingham) said he had been very much struck by these three points: (1) Saving in time, which one anticipated; (2) the great reduction, generally somewhere about one-third, in the volume of gas used for a given purpose; and (3) the greatly extended range of temperatures which the improved furnaces appeared to give. The last-named was a feature which made special appeal to furnace users. It had been very difficult, for instance, to get up to 1200° C. with old-type furnaces, and then to retain this temperature; but now one could go up to as high as 1800° C. This was a great achievement; and the difference between 1200° and 1800° opened up an entirely new field for town gas for melting particularly the heavier metals.

Mr. J. Wilkinson (Nottingham) had been much interested in the remarks that had been made in the discussion with regard to a comparison between town gas and producer gas; and he could not resist the temptation to turn his mind back to a heading in a recent issue of one of the technical papers: "Why Make Coke?" When one considered the difference between the calorific value of the gas supplied by one undertaking and of that supplied by another—say, 280 B.Th.U. in the one case and 560 B.Th.U. in the other—and took into account the factors to which attention had been drawn, one was inclined to wonder whether one was on the right lines, or regarding the matter in the true perspective, when remaining content to follow in the paths of these two extremes.

A UNIFORM GAS?

He was not at all sure that the time had not arrived for giving serious consideration to whether a uniform calorific value throughout the whole of the country would not ultimately be in the best interests of the gas industry. ["Hear, hear."] He had given careful thought to this, and had come to the conclusion that it was time for them to give earnest consideration to the question of what was the best calorific value gas to supply in the interests of the community at large and of the industry as a whole. There were, of course, individual circumstances and individual interests; but it did appear to him that, with conditions as they operated to-day, there was too wide a margin of opinion among representatives of the gas industry as to what was the right gas to supply to the public generally. They would have made a very great advance when they could agree as to the most advantageous calorific value of gas to supply. He did not say it should be one extreme or the other, but he maintained that they should concentrate their energies upon the question, and endeavour to arrive at a decision. This would greatly assist in bringing into still more general use the furnaces and other appliances to which reference had been made in the paper. It would be a big step towards the maximum possible use of gaseous firing in place of solid fuel.

Mr. W. M. Mason (London) pointed to the part taken by the "B.C.G.A." in dealing with inquiries regarding industrial gas apparatus, and indicated the valuable character of this co-operation. Printing works could not, he said, afford to-day to go on in the old way, because they wanted to keep down their costs. The "B.C.G.A." had in their offices a record of 3000 trades, and there was an average of seven processes in each of these trades to which gas was actually being applied. During the last big coal strike, the Glasgow Gas Department kept the big newspaper of that city going because of the gas they supplied, not only for the melting of the type, but for many other purposes as well. Two years ago, the "B.C.G.A." had a conference at Liverpool, and one of the most interesting visits in connection with that event was to the biscuit factory of Messrs. Jacobs—an all-gas factory, where huge quantities of gas were consumed daily. The big installation there had started in a very small way; but it had been carefully nursed by the Distribution Superintendent, who still kept an eye constantly upon it. In these circumstances, the increase in gas consumption every year since the start had been progressive. Mr. Glover had made reference to baking, which was a tremendous field, extending throughout the country. Another sound industrial proposition was "fish and chips." In fact, the whole industrial section offered enormous possibilities, which were ample justification for the greatest optimism regarding the future of the gas industry.

Mr. F. Prentice (Ipswich) supported the vote of thanks to the author, remarking that the name of Donkin had been one to conjure with in the gas industry throughout the whole of the forty years during which he (the speaker) had been connected with it. Judging from what they had heard that day, this proud position was not likely to be assailed.

The Author Replies.

Mr. Donkin said he had been asked how producer gas compared with coal gas. Well, he was afraid it did not really. Producer gas was made so very cheaply that, where a consumer had a large producer plant, it would be necessary to bring the price of town gas down very low—under 1s. 6d., and probably nearer 1s. per 1000 c.ft. —in order to compete with it. One would not get these very high temperatures with producer gas, but perhaps 1100° or 1200° might be reached. The furnaces to which he had referred in his paper could be adapted for use with producer gas; it meant just a different arrangement of the mixing apparatus. Refractories formed really a special branch of the industry, about which he could not say very much. Mr. Glover had asked the cause of the increased efficiencies of these furnaces, and had really answered his own question by saying it was probably due to the intimate mixing of the gas and air. The inspirator was some distance from the burners, and the gas and air were mixed there and continued to be mixed all the way to the burners. Thus one got a proper, homogeneous mixture, and therefore practically complete combustion.

Mr. Glover: What would be the mixture at the point of combustion—how much air and how much gas?

Mr. Donkin replied that it would be somewhere about 6 to 1. Galvanizing could be done with gas to compete with coke, if gas was fairly low in price. Probably at 1s. 8d. to 1s. 10d. per 1000 c.ft. it would compare with coke. Of course, there were other advantages with gas which enabled it to compete with coke; and he knew of one very large galvanizing works now which was going in for gas. Storage space for fuel was a very important question with many undertakings. His firm had designed a furnace—and there was one at work in Derby—for baking. He heard it was giving extremely good results. A point had been raised about changes in the calorific value of gas supplied to the furnaces. He did not see how they could very well make an inspirator which would compensate for alterations in calorific value, and so they must rely upon the gas being fairly constant in this respect. Range of temperature involved the efficiency of the furnace. If they wanted the highest possible efficiency, it was necessary to design a furnace for the work it had to do. Of course, 1800° C. was a very high temperature; but the oven type could run up to 1650° C., and it was very useful to have

furnace which would do this. He personally agreed thoroughly with what Mr. Wilkinson had said with regard to uniform B.Th.U. It would be a tremendous help to designers of gas apparatus to be able to cater for one value of gas. The "B.C.G.A." were most helpful in putting manufacturers in touch with possible customers. "Fish and chips" in many places had boosted gas consumption wonderfully. This was a branch his Company had been looking into, and might probably take up in combination with breadmaking.

SCOTTISH JUNIOR GAS ASSOCIATION.

(WESTERN DISTRICT.)

The 21st Session of the Western Juniors was brought to a close on Saturday, April 25, when, on the invitation of the Town Council of Renfrew, a large party visited the gas-works in the Royal Burgh, for the purpose of inspecting the new vertical retorts. The party were welcomed on arrival by the Convener of the Gas Committee, Bailie M'Queen, and the Engineer and Manager, Mr. D. S. Munn, who was a member of the first Council of the Western Juniors.

The Renfrew Plant.

The new plant consists of an installation of Woodall-Duckham retorts of the latest design, capable of carbonizing 44 tons of coal in 24 hours, and comprises eight continuous vertical retorts in two settings of four, each setting having its own producer, regenerator, waste-gas flue, and damper. Each retort is built entirely separate from the adjacent ones, thus allowing for either one, two, three, or four retorts in each setting to be worked at one time.

The retort house consists of a steel-framed structure strongly braced together by means of trimmers, and filled in between with 4½ in. brickwork reinforced with "Exmet." The waste-heat boiler is of the Woodall-Duckham firetube type, constructed by Ruston & Hornsby, Ltd., of Lincoln, and is capable of raising about 1000 lbs. of steam per hour at a pressure of 120 lbs. per sq. in.

Coal for the plant is brought in wagons on an elevated railway siding at one side of the coal store, into which the coal is discharged by means of either of two electrically-operated end-tipping rams constructed by Messrs. Babcock & Wilcox, through a concrete receiving hopper built under the siding. From this hopper the coal is fed into a small receiving hopper placed in the coal store floor, and thence passed into a single-roll breaker of Babcock & Wilcox design capable of dealing with about 25 tons of bituminous "run of mine" coal per hour. The broken coal, together with the fine coal passing through the screen, is fed by a specially-designed rotary filler into a gravity bucket conveyor of a standard type, as manufactured by Messrs. Babcock & Wilcox, of about 25 tons per hour capacity. This conveyor elevates the coal and discharges it into hoppers above the retort bench, which are designed to hold sufficient coal for 48 hours' maximum consumption. To drive the mechanism for the coke extractors, two gas engines are installed, each capable of developing 1¼ B.H.P. as a maximum load. One of the engines acts as a stand-by.

The whole of the electric current required for the plant is supplied by duplicate electric generating sets, one acting as a stand-by. Each set consists of a 44 B.H.P. "National" gas engine driving a 26 KW. dynamo by means of a belt. The current generated is alternating at 440 volts, 25 cycles, 3 phase, when running at a speed of 750 r.p.m. The dynamos and motors are the manufacture of the Lancashire Dynamo Company.

The plant is specially designed to allow an extension of a further setting of four retorts to be made at some future date.

Complimentary Remarks.

After the inspection, the party adjourned to the Town Hall, where they were entertained to tea—Bailie M'Queen presiding.

Provost M'Gregor, welcoming the Juniors to Renfrew, said that, in a progressive burgh such as theirs, they always were glad to have a visit from a body whose aim was the advancement of their general knowledge.

Mr. J. M'Isaac, President of the Western Juniors, said that the visit was a fitting close to the session. He thought that everyone present would endorse his opinion when he said that the entire layout was compact, complete in every detail, and a credit to the Burgh. He thanked the Provost and Council for the privilege of seeing their works, and hoped that the results which were bound to come in the near future would fully justify the capital expenditure involved.

Mr. Munn also expressed his pleasure at having the Association at his works. He mentioned that twenty years ago the Juniors had visited Renfrew, when their output was approximately 46 million c.ft. against 115 millions to-day.

Various other speakers followed, each passing complimentary remarks on what they had seen in Renfrew.

Illuminating Engineering Society.—A meeting of the Society will be held on Tuesday, May 19, at the "E.L.M.A." Lighting Service Bureau, No. 15, Savoy Street, Strand W.C. 2, at seven o'clock, when a paper on "A Survey of Lighting in 800 Retail Shops" will be read by Messrs. W. J. Jones and H. Lingard.

COKE AS A FUEL FOR ROAD VEHICLES.

At a recent meeting of the Institution of Engineering Inspection, Mr. Thomas Clarkson read a paper on "The Evolution of Steam Boilers for Special Purposes," in which he paid particular reference to their use in road transport.

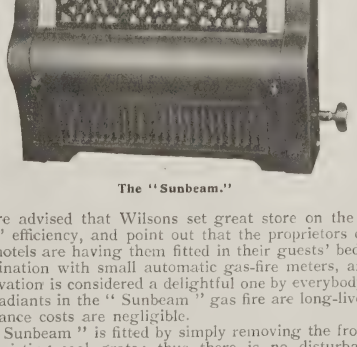
During the discussion the question of the use of coke as a fuel for 'buses and commercial vehicles was referred to.

Mr. Skinner suggested that the only difficulty in utilizing gas coke in a boiler of the type described was the clinkering trouble. Almost every small town had a gas-works, and filling stations could be erected throughout the country with, perhaps, only a few miles in between—not necessarily because the gas-works were only a few miles apart, but because the filling stations could be supplied from the gas-works near at hand. Therefore, instead of advocating boilers which utilized coal to better advantage than before, they should advocate the use of coke in the national interest.

Mr. Clarkson said there was no difficulty in using coke. Many of the boilers in this country were working on nothing but ordinary gas coke; and there was a report in "The Times" the other day of a firm in Preston running about 24 wagons 12,000 miles per annum on gas coke alone. Some of the wagons were still running well after having done 140,000 miles. The commercial aspect was to consider how many B.Th.U. one got for a penny. Petrol at (say) 2s. per gallon gave about 5000 B.Th.U. per penny, but with coke at £2 per ton they got 50,000 B.Th.U. per penny. As regards clinkering, there was no difficulty at all. Runs of over 100 miles per day had frequently been accomplished without clinkering. The small amount of clinker formed was porous and friable, and did not cling to the bars at all. The use of coke should be extended, though not, perhaps, for passenger vehicles, though it had been used for this purpose. There was a certain amount of sulphur in the coke which had to be reckoned with. The trouble could be got over by lime washing the coke before use, which effectively absorbed the objectionable sulphur in drying. During the war 'buses were run on the London streets with lime-washed coke. At that time, however, they had not the advantage of the new type of boiler.

THE "SUNBEAM" GAS FIRE.

We hear from Wilsons & Mathiesons, Ltd., of Leeds, that their "Sunbeam" gas fires have had a tremendous sale during the last autumn and winter, bringing the year's total to well over the previous high record of 1923. This is very interesting, as indicating not only the permanent hold that this type of gas fire has obtained on the public, but also that its efficiency and general behaviour are such as will justify confidence in its continued success.



The "Sunbeam."

We are advised that Wilsons set great store on the "Sunbeam's" efficiency, and point out that the proprietors of well-known hotels are having them fitted in their guests' bedrooms, in combination with small automatic gas-fire meters, and that the innovation is considered a delightful one by everybody. The curved radiants in the "Sunbeam" gas fire are long-lived, and maintenance costs are negligible.

The "Sunbeam" is fitted by simply removing the front bars of the existing coal grate; thus there is no disturbance or covering of the canopy, &c. We are told that a large stock of these fires is being built up by the manufacturers, in anticipation of a considerable demand in the coming autumn.

Institution Meeting.—Members intending to be present at the forthcoming annual meeting of the Institution of Gas Engineers are requested to send in their reply forms by Saturday, May 9, at the very latest, as it is essential that the number attending should be known by that date in order that the details of the arrangements may be completed.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Combination Gas and Electricity Supplies.

Sir,—It would be a pity if Mr. Broadbent's question at a recent meeting of the London and Southern Junior Gas Association, reported in the "Journal" for April 22, p. 247, was not answered. It was to the effect that he would like to know whether anything had come of the co-operation between gas-works and electricity works referred to by me when I had the honour of reading a paper before the Association. The answer is that I can speak of the following, because I am concerned in them.

The Crowborough Gas Company put their Electricity Act into force, and are now running a combined gas and electricity undertaking. The Swanage and Oakham Gas Companies obtained Electricity Acts, and both these Companies are now running combined gas and electricity undertakings. The Port Talbot Corporation have placed contracts for electricity plant to be erected on their gas-works—the two undertakings to be run together. Spalding Urban District Council are about to call for tenders for plant to do the same thing. Retford Corporation are only awaiting the consent of the Electricity Commissioners to carry out the scheme. The Horley Gas Company's Electricity Bill was reported fully in the Technical Press just recently. [See "Journal" for March 25, p. 750; April 1, p. 63; April 8, p. 128.] There are several other cases that are not sufficiently advanced at the moment to mention, and there are several combinations of gas and electricity in which I have not been concerned, and there are various committees working on the subject, with a view to carrying out the work on a larger scale.

The whole of this, however, is very small compared with a movement on foot, which, I sincerely trust, will bring about a very extensive development of the principle. I think all these things have happened since the reading of my paper before the Association, and I do not think the progress is bad, considering what a terrible country this is in which to get anything fresh carried out. (No better example could be cited than that mentioned by Lord Bearsted in the "Times" last week, when he pointed out that at least one English marine steam engine builder had been compelled to close-down the works for lack of orders, because makers had not seen or regarded the development of the internal combustion engine for ship propulsion, the consequence being that many orders for such engines were placed with Continental engine works by English shipowners.) As most people know, on the Continent and in U.S.A. control of gas and electricity is very largely in the same hands, whereas in this country it is still the exception. As I gain experience in the combination of these industries, I maintain more forcibly that it is advantageous in the largest systems and absolutely essential in the smaller districts such as thinly-populated rural areas. Estimates prepared on all kinds of bases show this.

A. Hugh Seabrook.

146, *Bishopsgate, London, E.C. 2,*
April 28, 1925.

REGISTER OF PATENTS.

Discharging and Charging Retorts.—No. 231,220.

Dempster, R., & Sons, Ltd., and Woodhead, C. J., both of Elland.

No. 29,941; Nov. 28, 1923.

This invention for discharging coke from, and charging coal into, through retorts relates to apparatus in which a spiral conveyor is mounted in a carriage and adapted to be supplied with coal from a hopper or other feeding device; the holder being provided at its forward end with one or more hinged pusher plates. Means are provided for traversing the spiral conveyor and holder through the retort so that the pusher plates discharge the coke therefrom. During this operation the spiral conveyor is not rotated and the major portion of the charge of coal which has been deposited into the spaces between the spirals is carried into the retort. On the return movement, the spiral conveyor is rotated to discharge the coal into the retort as the conveyor is withdrawn.

According to this invention, the spiral conveyor is caused to rotate at any predetermined speed in relation to its speed of withdrawal, with the result that the coal is left in the retort, being supplemented and banked up as desired.

Fig. 1 is a vertical section of the apparatus, and figs. 2 and 3 a side elevation and a plan of the first section of the conveyor.

A indicates a spiral conveyor, B the holder, C the hopper, and D the pusher plates; and the conveyor is built up in sections connected together by universal joints *a*. The holder B is also built up in sections comprising two side plates fitted with bearings *b* for the conveyor sections to run in. Each side plate has attached to it a rack b^1 for engagement with a toothed wheel b^2; and the sections are hinged together at b^3, and are provided with studs b^4 arranged coaxially with the hinges b^3. These studs travel round curved guide rails mounted on a carriage F, which runs on rails *f* and can be traversed past the retorts. Mounted on the carriage below the front section of the conveyor and holder is a slidable bridge. The front conveyor section is fitted with the pusher plates D, which are shown in the form of doors hinged to the side plates B. The back section is connected by a universal joint with a shaft H, on which is a bevel wheel *h* gearing with a bevel wheel h^1 on a shaft h^2 on which is a bevel wheel h^3 gearing with a bevel wheel h^4 on a shaft h^5. On the latter is mounted a free wheel or its equivalent. The shaft h^5 is driven from the motor h^6 through the intervention of a gear box h^7 by means of which the speed of rotation of the conveyor A can be varied in relation to the speed of the toothed wheels b^2, which are driven by a belt or chain from the motor h^6.

Prepayment Meters.—No. 230,998.

Sutherland Meter Co., Ltd., and King, F. H. W., both of Birmingham.

No. 7655; March 28, 1924.

This invention is applicable to coin-controlled meter mechanism of the type covered by specification No. 227,601 [see "Journal," Vol. 169, p. 615]. It provides for a convenient form of shield or shutter to prevent tampering with the mechanism through the coin slot after prepayment has been made.

The shutter comprises a plate having a portion which serves as a handle and having a boss which engages on and extends to the end of the operating spindle. It is formed from a single piece of metal and has an integral upturned lip to form the operating handle of the coin casing.

Pressure Relief-Valve Apparatus.—No. 231,027.

Harrison, J. F., of Glasgow, and Peebles, W. C., of Bonnington.

No. 11,130; May 6, 1924.

This invention has for its object a sensitive pressure relief valve for gas or air, of simple construction, effective in action and applicable for dealing with low pressures such as occur in the handling of commercial gas—for example, relieving increase of pressure in gas retorts when there is a stoppage in the foul main or when the exhausters are inoperative.

From the cross-sectional elevation which we reproduce, it will be seen that there is provided a valve casing A adapted for connection to the pressure-loaded main. Within this casing, and controlling the exit therefrom, are double-beat valve elements A^1, A^2 of bell type having lips depending into water-seals A^3, A^4. These valve-elements A^1 A^2 are carried by a vertical spindle A^5. The spindle A^5 carries a regulating bell B arranged in a vessel B^1 above the casing A and provided with water-seal B^2. Where the spindle A^5 passes through it there is provided on the regulating bell B, instead of packing and in order to reduce friction, a dependent bell B^3 in a water-seal B. The upper end of the spindle A^5 is connected by a chain C to one end of a two-armed quadrant lever C^1, the other end of which has depending from it weights C^2 which may be varied. The bell B is externally open to the atmosphere and internally connected with the source of pressure by means of a pipe D opening into its under side. In the pipe D there is provided a valve or cock (not shown). Fresh water inlet pipes D^1 are provided by means of which the seals may be replenished, and there is also an overflow pipe D^2 in connection with the seal B^2. A pipe D^3 is provided to connect the interior of

FIG. 1.

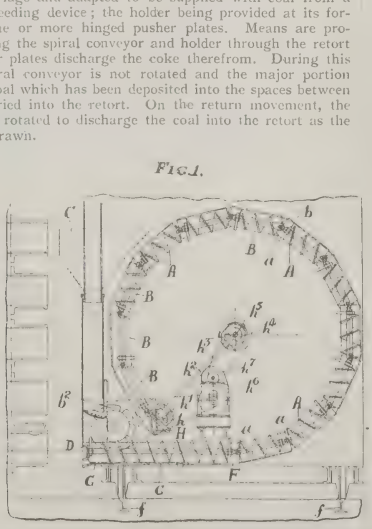


FIG. 2.

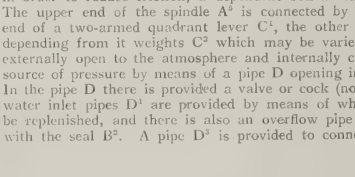
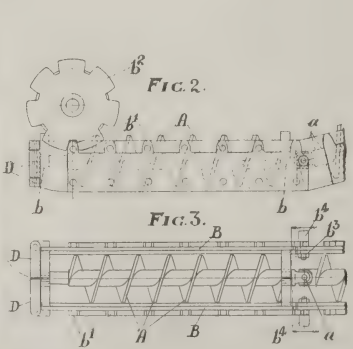
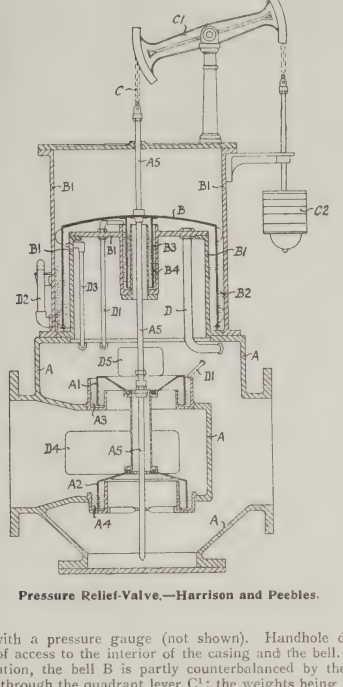


FIG. 3.



Charger-Discharger—R. Dempster & Sons, Ltd.



Pressure Relief-Valve.—Harrison and Peebles.

e bell with a pressure gauge (not shown). Handhole doors D^1, allow of access to the interior of the casing and the bell.

In operation, the bell B is partly counterbalanced by the weights acting through the quadrant lever C^1; the weights being so chosen at they, together with a predetermined pressure inside the bell, mpletely counterbalance the mechanism. When that pressure is ceeded in the pipe D, and therefore in the bell B, the bell rises, d, acting through the spindle A^3, carries with it the valve elements , A^2, so allowing escape of gas or air till the pressure is restored, hen the bell descends and so closes the valve. The valve on the pipe is set to control the rate of ingress and egress of the gas or air to from the bell B, thus steadying it and preventing the valve dancing nen the pressure is about critical.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Bills read the third time, passed, and sent to the Commons: Hoyce and West Kirby Urban District Council.

Bills brought from the Commons, read the first time, and referred the Examiners: Barrow-in-Furness Corporation, Bolton Corporaon, Gas Light and Coke Company, Stockton-on-Tees Corporation.

Gas Regulation Act.

Copies were presented of drafts of Special Orders proposed to be ade by the Board of Trade under section 10 of the Act, on the pplication of the Altrincham Gas Company and the Stockton-on-ees Corporation.

The draft Special Orders relating to the East Grinstead Gas and Vater Company, Monmouth Gas and Water Works Company, and the ough Gas and Coke Company, were agreed to, on the motion of e Earl of Clarendon (on behalf of Viscount Peel).

HOUSE OF COMMONS.

Progress of Bills.

Bills read the third time, and passed: Barrow-in-Furness Corporaon, Gas Light and Coke Company, and the Stockton-on-Tees orporation.

Bills read a second time, and committed: Horley District Gas ompany (Electricity Supply) and the Rochdale Corporation.

Bill read the first time, and referred to the Examiners: Hoylake id West Kirby Urban District Council.

The Kilmarnock Gas and Water Provisional Order Bill was preented by Colonel Sir John Gilmour, read the first time, and referred the Examiners.

LEGAL INTELLIGENCE.

EXTRACTION OF TOLUOLE.

Dr. Davidson's Claim on the War Office.

The hearing of the claim of Dr. W. B. Davidson for compensation in respect of processes for the extraction of toluole from coal gas [*ante*, p. 322] was resumed last Monday before the Royal Commission on Awards to Inventors (presided over by Mr. Justice Tomlin).

Dr. *Davidson*, in cross-examination, said the question of whether to separate-out the hydrocarbons or to leave them in the gas was dependent on whether the hydrocarbons were worth more when separated than when left in the gas. It also depended on the risk run in supplying gas containing naphthalene; it was not simply a matter of £ s. d. The use of hydrocarbons for stopping naphthalene was not thoroughly well known in 1913. He had no recollection of having seen an article in the "Journal of Gas Lighting" in 1899 on the difficulty of dealing with naphthalene. Solvent naphtha, he believed, had been used for the purpose of getting rid of naphthalene. The main point was that it was detrimental to the gas. The making of gas was not a secondary consideration to the production of residuals. For town gas one had to consider the necessity for keeping-up the calorific and illuminating properties. Before the war very little toluene was produced, and what was produced was by chemical works. The gas was enriched by the addition of hydrocarbons, and petrol was one of the commonest things employed. His process differed from what was well known in 1913, in respect that it consisted in adding the toluene or benzole substitutes to counteract the loss in candle power which otherwise would have resulted. In the "Journal of Gas Lighting" of September, 1900, he believed there was an article upon the benefit of using pure naphthalene. His invention was complete towards the end of December, 1914. In connection with the investigation of the idea of his invention, a research laboratory was set-up, which cost a considerable sum.

The President said he thought it was a little unfair that a man should be out of pocket if he had incurred certain expenses on behalf of the Government in doing valuable work.

Mr. Terrell replied that he was instructed to say that the War Office would consider any application that might be made in respect of out-of-pocket expenses.

Witness said that throughout 1914 he was in the employ of the Birmingham Corporation; but he had not heard of any arrangement that his services should be placed at the disposal of the Government on condition that the Corporation should not suffer any financial loss by reason of the alteration of any of their plant.

Mr. *Ernest Walter Muddiman*, a chemist, and one of Dr. Davidson's assistants, said he carried out many experiments for Dr. Davidson in his own time, and received about £40 for such services. He made considerable research into literature, in order to see what had been done on the subject; but the result was negative.

This was the case on behalf of the claimant; and the following evidence was called on behalf of the War Office.

Sir *Wm. J. Pope* said the use of washing oil for the purpose of removing hydrocarbons, the addition of xylene for the purpose of preventing the deposition of naphthalene, and the use of paraffin for the same purpose, was well known to all chemists. The process was described in the patent of Glover; and two papers on the subject appeared in the "Journal of the Society of Chemical Industry" in 1883. One was by G. E. Davis, on the distillation of coal and recovery of hydrocarbons from the gas. There the author said that the idea of extraction of hydrocarbon vapours from coal gas was not entirely new. Caro in 1869 obtained a patent for the absorption of them in heavy oils or naphtha, using the purified gas; but the process could not have been a success commercially, or there was no doubt they would have heard more about it. In 1865 a patent was taken out by Jaeger, of Baltimore (U.S.A.), for apparatus to be used in distilling oils and other liquids from coal; and in 1875 Young obtained protection for another form of plant. About this time John Barrow patented the application of refrigeration to the collection of the vapours of solvent naphtha evolved in rubber working, afterwards absorbing them in oil. In 1882 Hardman obtained a patent for the removal of benzene and its homologues from coal gas by absorption of them in heavy coal-tar oils or naphtha. The difference, however, between Hardman's patent and Caro's process was that the former preferred to use unpurified gas, while Caro selected purified gas. Hardman also claimed the use of the gas, after being deprived of its benzole, for heating purposes; but Young in his patent distinctly said the denuded gases, after having parted with any hydrocarbon vapours absorbable by the oils, passed away, to be used as fuel or otherwise consumed. The gas, after extraction of benzene and other hydrocarbons, could be re-carburetted and utilized for lighting; some of the oils of lower boiling-point than benzole being employed for this. If benzene and toluene were required for manufacturing purposes, they could be obtained from coal tar; but previous to the war it was not considered economical to extract them. It was more important to leave the benzene in than to take it out, and the same consideration applied to toluene. The demand for toluene was comparatively small before, though it became of paramount importance during, the war. The process for doing this had been fully explained in the scientific journals.

In cross-examination, witness said the process of Dr. Davidson, with which he was familiar, had been of enormous service.

Dr. *Harold G. Colman* and Dr. *Adams* having given evidence as to the coke-oven process for extracting toluene from coal gas, and the Beckton toluene recovery process, which was described in the "Gas Journal,"

Mr. Whitehead submitted that this was a case in which the Commission would be justified in making an award for compensation, as the process was a new and novel one, and of great utility. It was not necessary, as a condition precedent to making an award for compensation, to find that there was an invention.

MISCELLANEOUS NEWS.

ALDERSHOT SPECIAL ORDER.

Application to Extend Powers Under the Capital Issues Act, 1920.

An Extraordinary Meeting of the shareholders of the Aldershot Gas, Water, and District Lighting Company was held last Thursday, for the purpose of approving an application to the Board of Trade for a Special Order under section 10 of the Gas Regulation Act, 1920, relating chiefly to the capital and borrowing powers of the Company.

The Chairman (Mr. R. W. Edwards) outlined the position as follows:—The meeting is called in accordance with the rules of the Board of Trade, to submit for the approval of the shareholders a Special Order for which the Directors have applied. The portion of the Order which requires the approval of the shareholders is as to the increase in the borrowing powers. The shareholders will probably be aware that formerly the established practice was for the borrowing powers of gas companies to be limited to one-fourth of the share capital. This was subsequently altered to one-third, which is the proportion fixed in the Company's later Acts. In the year 1920, owing to the special financial conditions arising out of the War, an Act was passed dealing with the question of raising of capital by Companies carrying on certain statutory undertakings (which, of course, included gas companies). This Act was called the Public Utility Companies (Capital Issues) Act, 1920, and among other things authorized companies, with the consent of the appropriate Government Department (in our case the Board of Trade), to issue debenture stock or borrow to an extent of one-half of the share capital for the time being issued and paid up. The Company applied to the Board of Trade, and obtained their assent to exercise any such powers. The Act was a temporary one which was to continue in force for five years from the date of its passing; which five years terminates on May 20. The Act provides that its expiration should not affect the validity of anything done in pursuance thereof; and the Company were advised that, under this saving clause, the consent of the Board of Trade would continue in force notwithstanding the expiry of the Act. Questions, however, recently having arisen as to whether this was the correct position, the opinion was taken of a very eminent Parliamentary Counsel, who advised that, while any stock actually issued before May 20 would remain perfectly valid, the Company could not after that date borrow under consents, even though such consents were obtained before that date. In these circumstances, the Directors have thought it desirable to ask the Board of Trade, by Special Order, to authorize the proportion of one-half as a permanent relation between the Company's borrowing powers and share capital. Incidentally, I believe that we are the first public utility undertaking, and certainly the first gas company, to adopt Special Order procedure for this particular purpose. The Directors have also taken the opportunity, having an Order before the Board of Trade, to include certain other matters and clauses which they think would be desirable in the Company's interests.

The Chairman then moved that the draft of the Special Order submitted to the meeting be approved, subject to any alterations which might be made therein by the Board of Trade and approved by the Directors.

The Deputy-Chairman (Mr. Thomas A. Braddock) seconded the motion, which was passed unanimously.

As the Chairman suggests in his remarks, this is the first application to the Board of Trade for a Special Order to continue the temporary provisions of the Public Utility Companies (Capital Issues) Act, 1920, which will expire on May 20 next; and if the Order is granted it will form a valuable precedent in the industry for the extension of loan capital powers, and will obviate the delay and expense otherwise entailed in seeking powers direct from Parliament by means of a Bill.

ROTARIANS AND GAS SERVICE.

At a meeting of the Bridlington Rotary Club on April 26 (Mr. Harry Davis in the chair), Mr. John Kelly (Secretary and Manager of the Bridlington Gas Company) gave an address on "The Realization of the Ideal of Rotary in the Gas Industry."

If, he said, I understand it aright, the ideal which primarily inspires Rotary is that of rendering the best service of which its members are capable. The obtaining of personal profit or advantage is secondary. Because the gas industry in this country is unique in being so constituted by law as a public utility, so far as gas companies are concerned, as to compel it willy-nilly to conform to that ideal, it is peculiarly fitting that I should address you on the public supply of town gas by gas companies. When, rather more than a century ago, gas first began its career of public service, usually by means of public companies, it was thought that the best, cheapest, and most efficient service could be secured by free competition. The evil results of unfettered competition soon made unquestionably manifest the fact that quasi-monopoly was the only method by which the true economic interest of the community could be served. Parliament therefore decided to grant such monopoly to undertakings established to supply gas in defined areas, and in order to secure that public service should be the primary consideration, made enactments to that end. Little more is possible here than briefly to draw your attention to the way in which the financial provisions of the law make service the primary, and a strictly limited profit the secondary, consideration. At first this was done by fixing a maximum price of gas, coupled with a maximum dividend, usually 10 p.ct. It must be remembered that in those days capital could not have been obtained had a lower rate been fixed; also that in most cases many years elapsed before any dividend at all could be earned, and that many more years passed before gas companies were in a position to pay maximum dividends. Companies were then permitted to establish a reserve fund to an amount not exceeding one-tenth of the nominal capital. Later on, in the 'seventies of last century, when gas had become firmly established as a public utility, and formed a safe and profitable medium for investment, Parliament, at the instance of an eminent gas engineer of that day, and who but recently died, adopted a new method a far more effective one—of securing that service should be the primary consideration in the supply of gas, and profit not merely secondary one, but an incentive to economy and sale at a low price. This was done by means of what are called the sliding-scale and the auction clauses of the Gas Acts. The auction clauses compel capital to be raised by either auction or public tender. The highest bids must be accepted, and no preference given to existing shareholders. Coupled with the auction clauses are the sliding-scale clauses which fix a standard price of gas and a standard dividend. The sliding-scale provides that, whenever the price of gas is raised above the standard, the dividend is reduced, and whenever the price of gas is reduced below the standard, the dividend may be raised. Recently this slide has been applied to the therm system, the principle being the same, but with a special provision dealing with the question of increase in costs due to causes beyond the control of undertakers.

It will be clear that this wise and far-seeing legislation has embodied the ideal of Rotary in a really marvellous way; the sliding-scale being designed to penalize any increase in the price of gas by compelling a consequent reduction in dividend from the authorized rates, and to reward reductions in price by permitting increased dividends, both according to scale. There is here no incentive whatever to obtain a high price, but an incentive to the economical manufacture and distribution of gas at as low a price as possible. Of late years, gas undertakings have been authorized to set up co-partnership schemes. Generally, a bonus to employees under these schemes is based on a sliding-scale of the same type, so that all parties—consumers, employees, and shareholders—gain by reductions in price, and lose by an increase. Commonly the degrees of gain or loss are in the region of six-sevenths or seven-eighths to the consumer, and one-seventh or one-eighth to the shareholder and employee combined.

In the case of my own Company, proceeded Mr. Kelly, the consumer gains to the extent of £770, while shareholders and employees only gain about £118, by a reduction of 1d. per 1000 c.ft., or one-fifth of a penny per therm. The principle is not a purely altruistic one, since all interests gain or lose in common by its application, but it is based essentially on the idea of service first, profit being secondary, and proportionate to the efficiency and usefulness of the service rendered. There is a great and instructive difference between the service rendered by sliding-scale companies in the gas industry, and the rewards for it, and the service and rewards of practically every other industry. In the gas industry, the higher the price of gas the lower the dividend must be. In other industries the higher the price of the commodity the higher the profits and dividends will be. In other words, outside the gas industry the financial interests of producer and seller are opposed to those of the buyer, while in the gas industry they are identical. I venture to think that, if the basic principle of the sliding-scale could be applied throughout industry it would go far to solve many of the industrial problems of the day. The effects of the practical application of the principle throughout the whole of the sliding-scale gas companies of this country is worth the consideration of those whose duty it is to deal with these problems. A further consequence of the sliding-scale is absolutely to prevent any profiteering on the part of gas companies. No doubt many people unacquainted with these facts who read of a gas company paying dividends of (say) 12 to 16 p.ct. will draw the erroneous conclusion that it is profiteering. The contrary is the fact. The capital is raised under the auction clauses. Shares are usually of a nominal value of £10, and stock nominally of £100. Dividends are paid only on the nominal values; but by the auction clauses, £20 and £30, and even more, is paid for a nominal £10 share, and £200 and £300 per nominal £100 stock. This is where the dividends are 12 to 16 p.ct. on the nominal capital. The shares are not really £10, but £20 or £30 ones, and the real dividend is usually between 5 and 6 p.ct. The important point is that, under the sliding-scale the higher the dividend the lower must be the price of gas. A high rate of dividend necessarily connotes a low price of gas, while a high price of gas equally necessarily connotes a low rate of dividend. Profiteering is therefore impossible. The high rates of dividend are merely nominal; the real rates being, as stated, usually between 5 and 6 p.ct. at present. In pre-war times the return was usually between 4½ and 5 p.ct.

Co-operation rather than competition would be the best service which gas and electricity could render. These are spoken of by the man-in-the-street as competitors; less so of late by those engaged in the two industries. I am one of those who think that co-operation would be far more fruitful to each, and of immensely greater service to the community, than competition can ever be. Public utilities, by their nature, are meant for co-operators, not competitors; and any dissipation of their energy in competition is just so much waste and disservice to the world.

Improved Nottingham Lighting.—Substantial improvements have recently been effected, to the great advantage of the city, in the illumination of Nottingham's main central thoroughfares, by the installation of new high-power gas lamps. Locally the work has occasioned the greatest satisfaction; and with the application of similar improvements to many of the districts radiating from the Market Place, the hope is entertained that Nottingham may speedily recover the position which it at one time occupied, of being one of the best-lighted cities in the Midlands.

Information Bureaux and Specialist Libraries.—The highly successful conference held at Hoddesdon in September, 1924, of Special Libraries and Information Bureaux, has resulted in financial support being obtained from the Carnegie United Kingdom Trust for a period of two years, in order to give the new movement an opportunity of becoming self-supporting. Mr. G. W. Keeling, of London (formerly of Winchester and King's College, Cambridge) has been appointed Organizing Secretary to the Committee which was formed during the conference to ensure the continued co-operation of the interests there represented. Active arrangements are being made for the holding of a second week-end conference next September, and for the preparation of a Directory of Special Libraries and Information Bureaux for the United Kingdom.

BOMBAY GAS COMPANY, LIMITED.

Ordinary General Meeting.

The Ordinary General Meeting of the Company was held at their Offices, Moorgate Station Chambers, London, E.C., on Wednesday, April 29. Mr. WILLIAM GRAHAM BRADSHAW, C.B.E. (Chairman), presided.

The notice convening the meeting and the Auditors' report on the balance-sheet were read by the Secretary (Mr. A. Dickson, Jun.).

THE LATE CHAIRMAN.

The CHAIRMAN said: We meet to-day under a deep sense of the almost irreparable loss which the Company have sustained in the death of our valued friend and Chairman, Mr. Henry Edward Jones. It is befitting, and it will, I am sure, be in accordance with your feelings, that, before proceeding to the business of the day, we should turn aside to recall the great qualities of the friend who has passed away from us, and the importance of the services which he rendered to the Company and the profession of which he was such a distinguished member. Mr. H. E. Jones was a man of outstanding ability and of striking personal qualities; in very truth he was a great man and a type of those who have made England great. Strong, virile, and courageous, both intellectually and physically, he was also tenderhearted and generous in his estimation of others. With an engaging personality and an exceptional easiness of approach, he had a force and decision of character which arrested and held attention. His great intellectual powers were trained and strengthened by an inexhaustible application, an intense concentration of purpose, and a wholehearted devotion to his work. The industry which he served with such distinction for more than sixty years conferred in his opinion a real benefit upon his fellow men. It was a constant pleasure to him to think that cheap gas brought to the working classes comfort and health, in enabling them to cook their food and warm their houses with an economy and efficiency which he believed they could not otherwise obtain. And therefore he threw the whole weight of his knowledge and enthusiasm into his profession. As a professional man he attained to the very highest position open to him. He was at various times in his career President of the Institution of Gas Engineers, President of the Institution of Civil Engineers—the blue ribbon of the whole engineering profession in this country—and the first President of the National Gas Council. In fact, he held every office of prominence which his fellow engineers could confer upon him; and he fulfilled them all with distinction and success. As a leader he was always ahead of his colleagues in every scientific and practical advance. A joint author of the sliding-scale, which has done more than anything else to establish the gas industry in this country, he was the first to apply it practically and put it into actual operation. As a friend—and nobody can speak more confidently on this point than I, for I am proud of the fact that I was his colleague and friend, here and elsewhere, for more than 37 years—he was staunch, warm-hearted, generous, wisely indulgent to the frailties of others, and ever ready and watchful to do them service. His own fidelity in friendship brought him its natural reward—the affection and confidence of his friends. It is the literal truth to say that those who knew him best loved him most. He was connected with this Company, as the Directors' reports remind us, for 33 years; and the services which he rendered to it surpass any expression of appreciation which I can give to them. He became Chairman 21 years ago, at an age when many men are thinking of seeking retirement and rest, and he sought its advancement and improvement up to the very date of his death, with unabated zeal and undiminished efficiency.

I beg to move "That this meeting desire to record their profound sense of personal and public loss in the death of their esteemed and valued Chairman and friend, Mr. H. E. Jones, and to convey to his family the expression of their deep sympathy." And I beg to suggest that we carry this resolution by standing in silence for a few moments, in token of our respect and esteem for our departed friend.

The meeting stood in silence.

The annual report of the Directors and the accounts of the Company were then taken as read.

The CHAIRMAN, in moving their adoption, said: You will, I feel sure, agree that the Directors could not have made a wiser or more appropriate choice of a colleague to fill the vacancy on the Board than Mr. S. H. Jones, the second surviving son of our late Chairman. Mr. Stanley Jones has been Chief Engineer and General Manager of the Commercial Gas Company for over twenty years. He has had an experience in that Company of gas engineering and administration for some thirty years, and has contributed largely to its continuous prosperity and success. He is giving up his position in that Company to become a Director of it, and to assume important positions in connection with other similar concerns; and I have no hesitation in saying that his knowledge and experience will be of the greatest advantage to this Company. I can wholeheartedly recommend him to you for re-election, and congratulate you as shareholders that we have such an able engineer and an administrator of such proved capacity to take a share in the management of our Company. I regret to say that Mr. A. R. Burch, our Engineer and Manager in Bombay, felt it necessary, on account of his health, to resign his office in October last. He served the Company faithfully and successfully in that capacity for eighteen years, and left it in a much stronger and more prosperous condition than he found it. I desire on the part of the Board to express our sense of the valuable service he gave to us, and our appreciation of the efficiency and ability with which he discharged the duties of his office in the trying climate of Bombay. We wish him every happiness and good health in his retirement. We have appointed in his place Mr. W. T. Lane, who has 25 years' excellent service with the Company to his credit: and I have no doubt he will fully justify the confidence in his ability and knowledge which the Directors have thereby expressed.

THE YEAR'S WORKING.

Now I turn to the record of the Company's operations for the year to which the report and accounts relate. It will be within your knowledge that the trade of Bombay, especially as regards its staple industry the cotton mills, has been during the last year in a depressed condition, all classes of the community being adversely affected by it. For a period of two months the mill industry was disturbed by a strike involving a great loss of earnings to the mill operatives and to the large body of shareholders in the mills, and causing a considerable reduction in the spending power of the public. It is a matter for congratulation that in face of these adverse trade conditions there should be signs of improvement in our own affairs. This is indicated by the increase of 3 p.ct. in the sale of gas, against a decrease of 3 p.ct. in 1923. There was no marked difference in the rate of increase at any one period of the year; the increase for the first half-year being 3·1 p.ct. and for the second half-year 2·9 p.ct. It is reassuring to note that the general foreign trade of India shows signs of improvement. The value of exports in 1922 exceeded the imports by 38 million pounds, in 1923 by 82 millions, and in 1924 by 96 millions. The value of exports in 1924 was 28 million pounds more than in 1923. As regards the Province of Bombay, the indications of reviving prosperity are not quite so clear, but are still to be seen in a smaller degree. There was an excess of imports over exports in 1922 of 2 million pounds; but in 1923 and 1924 the tide turned, and exports exceeded imports in each year by 13 million pounds. The improvement in the foreign trade of India as a whole is reflected in the course of the rupee sterling exchange, from which, as you will see, we have derived considerable benefit. Turning to the accounts, there are a few points only to which attention need be drawn. In the capital account it will be noticed that the capital issued is increased by £20,000, with £200 premiums thereon. In May last the Directors issued the £20,000 of capital remaining unissued at a small premium of 1s. for each £5 share. The market price was then, and is now, about £5 5s. per share; but this price in each case includes about 4s. per share of dividend, whereas the new shares issued did not participate in any dividend for six months, and were therefore worth 4s. less—or £5 1s., the price obtained for them. Before making the issue, the Directors made such inquiries as were open to them, in order to ascertain whether the existing shareholders were likely to take up the issue at the price named or a little less; and we were forced to the conclusion that, unless we were to issue the shares at less than their par value, which our articles do not authorize, and which we did not think was in the best interest of the Company, and therefore of the shareholders, it was preferable to sell the issue *en bloc*, reserving, as we did, a portion of it for such shareholders as cared to apply. Somewhat to our surprise, and to our great regret, some shareholders—not more than three or four—applied too late, and were disappointed: but I do not think they lost much, and the opportunity of acquiring a larger holding in the Company will possibly recur in the not distant future, if the business of the Company continues to expand as I hope it will. The total capital expenditure for the year amounts to £8353. The expenditure on new mains amounted to £6634, the distribution system having been considerably extended and improved, some 10¾ miles of new mains having been added during the year. We must look for a considerable expenditure under this head in the future, but we shall take care to ensure that, where possible, it is remunerative. You will agree that the prosperity of the Company cannot be maintained without judicious extensions of its area of supply. The sum of £491 for land represents the purchase of rights held by the Bombay Municipal Corporation in a watercourse running through land acquired by the Company. At the close of 1923 the amount of capital expended in excess of capital raised was £62,402. This has now been reduced by £11,848 to £50,554. It will be necessary to refer to this later on, when a resolution will be submitted to the meeting for increasing the authorized capital of the Company. The total capital employed is equivalent to £958 per million c.ft. of gas sold (10s. 2d. per 1000 c.ft.). When I joined the Board about twenty years ago it was nearly double that amount. In the revenue account, the receipts from gas are less by £3190, though we sold an additional 11 million c.ft. This is accounted for by the reduction of 8d. per 1000 c.ft. in the price of gas used for lighting which was made as from Jan. 1, 1924, a reduction of 8d. per 1000 c.ft. having been made in the price of gas used for heating purposes as from Aug. 1, 1923. The concession thus made to the consumers amounts to £7700 in a full year. The receipts from private consumers were less by £4374, but for public lighting the revenue was larger by £1184. Meter rental decreased by £570, by reason of adjustments and a smaller number of meters on the district. The revenue derived from coke was less by £2700, the sales having decreased by 1190 tons; less coke being made, because a smaller quantity of coal was carbonized. During the first half of the year the demand for coke practically kept pace with production; but towards the end of the year the market was disturbed by the competition of the Bengal coke-oven companies, who, finding their local demands falling-off, dispatched coke to Bombay, and dumped it there at low rates. This action made it difficult not only for ourselves, but for our contractors, to sell against them. The selling price of coke is also affected by changes in the price of coal. At present the price of coal, and therefore of coke, has a downward tendency; and there appears to be every indication that, in common with the rest of the world, we in Bombay must look to some reduction in the very favourable rates we have been receiving for our coke during the past few years. The average yield of coke and breeze was 46s. 3·9d. per ton, compared with 45s. 7·5d. in 1923. The sale of tar was again satisfactory; the demand being always in excess of production. The average price obtained was 0·7d. per gallon. On the other side of the revenue account the expenditure is less by £1063. Coals cost £2374 more; the price per ton carbonized being 30s. 11d., against 35s. 9d. in 1923. Some advantage, however, has been gained by improved working, as we carbonized 1897 tons less coal for an increased sale of 11 million c.ft. of gas. The sale of gas per ton of coal carbonized amounted to 13,093 c.ft., compared with 12,125 c.ft. in 1923—an improvement of 968 c.ft. per ton of coal. New contracts have been arranged for the supply of additional coal at lower rates, concurrently with deliveries under an existing contract. This will afford some considerable immediate financial relief by way of averaging carbonizing costs. Owing to the smaller revenue from coke, the net cost of coal, after deducting receipts from residuals, was

7·7d. per 1000 c.ft. of gas sold, against 4·7d. in 1923—an increase of 3d. per 1000 c.ft. Repair and maintenance of works is more by £1373. A sum of £3705 was expended in rebuilding and raising the floor level of five beds of retorts, but the expenditure on other items of wear and tear was less by £2332; the result being a net increase of £1373. A satisfactory feature will be noted in the reduced costs under distribution charges, which are less by £4393. The last item of expenditure "Workmen's Compensation Insurance Fund," appears for the first time. The Government of India having passed legislation for providing compensation to workmen injured in the course of their employment, it is necessary that some provision be made for meeting possible liabilities which the Company may incur. This can be done either by effecting policies of insurance or by building-up a special fund of our own. In view of the high rates of premium asked by the insurance companies for this business, and the practical immunity the Company has enjoyed in the past from any accidents of a serious nature, it is considered that the Company will benefit by providing its own insurance fund. Coming to the net result of the year's work, the balance of profit carried to the net revenue account is £21,761. There is a profit on exchange of £5185, compared with £855 in 1923; the average rate of exchange of the rupee being 1s. 5·4d., against 1s. 4·3d., and the amount remitted being £14,000 more than in 1923. Adding this profit and deducting the interest charges and the sum of £200 commission on new share issue, there remains a net profit of £25,834 for the year. Adding to this the undivided profit of £35,051 brought forward from the previous year, we have a total available profit of £60,885. Deducting from this the interim dividend of £12,000 paid in November last, and the usual additions to the reserve funds, amounting to £2675, there remains £46,208, out of which a final dividend of 4 p.c. is recommended, making 8 p.ct. for the year, leaving £34,208 to be carried to the current year, which is only £843 less than was brought in. I would, however, remind you that, in addition to the sum of £2675 added to our reserve funds, ample provision has been made in the revenue account before the balance of profit is arrived at for the upkeep of the works and distribution plant and for depreciation.

A COMPARISON.

I think that the following figures, which will give you a comparison of the state of the Company in 1910 and at the end of 1924, will enable you to form a fair estimate of the condition and progress of the business. The year 1910 has been selected for the comparison only because it is fifteen years ago, and fifteen years is a reasonable period to take. I would remind you that it includes the difficult years of the war and the period of high prices and increased wages which followed it.

—	1910.	1924.	Increase.	P.Ct.
	£	£	£	
Total capital expended	257,356	357,195	99,839	38
Total capital and premiums raised	240,000	306,640	66,640	27
Balance of capital expended over capital raised	17,356	50,555	33,199	..

—	1910.	1924.	Increase.	P.Ct.
	C.Ft.	C.Ft.	C.Ft.	
Gas sold	198,000,000	373,000,000	175,000,000	88
	£	£	£	
Revenue from gas	59,452	109,281	49,829	82
Total revenue	74,794	158,038	83,244	111
Revenue expenditure	56,153	136,277	80,124	142
Profit on revenue account	18,641	21,761	3,120	16
Dividend payment	16,800	24,000	7,200	42
Rate of dividend	7 p.ct.	8 p.ct.	..	..
	£	£		
Reserve funds	23,731	56,241	32,510	..
Carry forward	5,357	34,208	28,851	..
Temporary loan	15,000	1,000	14,000 decrease	..

I think you will agree with me that those figures show that the Company has grown not only in size, but also in strength and prosperity. With regard to the outlook, I have no inclination to attempt to prophesy. I have tried to put before you a fair summary of the work of the past year and the present position of the Company, and you can judge for yourselves as to its prospects. I will only add that, apart from extensions of mains and the provision of stoking machinery and coal and coke handling plant, which the changed attitude of labour in India may render advisable, we have no large capital expenditure before us. Our manufacturing works are sufficient for some years to come; we have paid off the whole of our Bank loan; and there are no debentures or mortgages upon the Company. The business increases steadily, if slowly, in spite of the tremendous competition of cheap electricity generated by water power, and the advantage which the Electricity Company gain in having a large proportion of Indian shareholders whose influence in Bombay is enormous. Our European staff are experienced and able, and are devoted to the interests of the Company. Our native staff and workpeople are beginning I think to realize that their employers have their welfare at heart, and can do better for them than all the agitators with their specious promises and allurements. The Company is stronger and better equipped than it has ever been, and in a good position to take advantage of any improvement which may take place in the trade of Bombay; and I venture to express the hope that, when next we have the pleasure of meeting you, we may have as favourable a report to present to you as we have to-day.

Mr. H. H. Macleod (Deputy-Chairman) seconded the adoption of the report and accounts.

Mr. W. J. Liberty pointed out that revenue from public lighting had increased, and asked whether there was competition with electricity in Bombay in respect of public lighting.

The Chairman said there was a great deal, and it was increasing.

Mr. Liberty said that, though the price of gas for lighting had been decreased, the revenue had increased, and this sounded very healthy.

The Chairman agreed that it was a healthy sign. The Gas Company were lighting most of the streets, and the Electricity Company were lighting some of the big crossings.

Mr. Liberty asked whether there was an increase or decrease of public lighting by gas.

The Chairman said that there was an increase. Public lighting had produced £1184 more in 1924 than in 1923.

The report and accounts were adopted unanimously.

THE FINAL DIVIDEND.

The Chairman proposed that a final dividend of 4 p.ct., less income-tax at 2s. 3d. in the £, be declared, payable on and after May 8, making, with the interim dividend of 4 p.ct., a total dividend of 8 p.ct.

Mr. H. H. Macleod (Deputy-Chairman) seconded.

The resolution was carried.

RE-ELECTION OF RETIRING DIRECTORS.

The Chairman moved that the retiring Directors, Mr. Louis Penny and Mr. Stanley Hunter Jones, be re-elected.

Mr. H. H. Macleod seconded.

Mr. Louis Penny said that he had tendered his resignation to the Directors on several occasions, but they had thought fit not to accept it. His reason for doing so was that he was 82 years of age, and he considered that, when a man attained this age, it was time for him to give place to a younger and more vigorous man. He had been in the service of the Company for nearly 42 years. For seventeen years he was Engineer and Manager in Bombay, for two years he was Auditor in London, and since 1902 he had been a Director. He would be sorry to give up his connection with the Company, but he considered it was time he should do so. If the shareholders thought fit to re-elect him, his intention was to place his resignation in the hands of the Chairman as soon as the latter had found a fit and suitable man to take his place.

The Chairman said that when they had got a good thing they stuck to it. Mr. Penny had local knowledge and long experience, and knew the Company more than any of them. It was wise to retain him.

Both Directors were re-elected.

Mr. Penny, expressing his thanks to the meeting, said he would keep to his resolve.

Mr. Jones also returned thanks.

RE-ELECTION OF AUDITORS.

On the motion of Mr. H. F. Hills, seconded by Mr. Bertram Ellis, the Auditors, Mr. Spencer Gore Browne and Mr. Alfred Morland, F.C.A., were re-elected.

This concluded the business of the ordinary general meeting.

Extraordinary General Meeting.

The notice convening the meeting having been read,

The Chairman moved the following resolutions:

(*a*) "That each of the existing £5 shares be divided into five fully paid-up shares of £1 each."

(*b*) "1. That the capital of the Company be increased from £300,000 to £400,000 by the creation of 100,000 new ordinary shares of £1 each.

"2. That the Directors be authorized to issue the said shares at such times and to such persons and upon such terms as they may consider expedient in the interests of the Company."

It was pointed out by the Chairman that the capital account was overdrawn by over £50,000, and the Company would have had to raise fresh capital immediately, except for the fact that the reserve fund was being used in the business. But if the Company had to expend much money in extension of mains, they would have to issue fresh capital. It would be noticed that the Directors were recommending the splitting of the £5 shares into £1 shares, and the issue of £1 shares when the fresh capital was issued. The reason was that shares of a smaller denomination sold on the market at a better price than shares of a larger denomination.

Mr. H. H. Macleod seconded the two resolutions.

The resolutions were carried nem. con.

The Chairman said that resolution (*a*) would have to be confirmed at a further Extraordinary General Meeting, to be held at the offices of the Company on May 27, at 3 o'clock.

VOTES OF THANKS.

Mr. Aschwanden tendered the hearty thanks of the shareholders to the Chairman and the Directors for the lucid manner in which the former had explained the accounts, and for the splendid way the business of the Company had been conducted during the past year. He also proposed a vote of thanks to the officers of the Company, particularly the Manager in India.

Mr. C. A. Morgan seconded, and the vote was carried with acclamation.

The Chairman, responding, expressed thanks for the manner in which the shareholders had recognized the work of the Board and the officers of the Company. He wished to bear his personal testimony to the manner in which the officers had carried out their work. As for Mr. Dickson (the Secretary) and his staff, he could not say too much. They provided the Directors with the most wonderful statistics, and, unlike a great many statistics, they were all useful. To Mr. Burch (the late Manager at Bombay) and Mr. Lane (the present Manager) and the staff in Bombay, the Company owed a deep debt of gratitude; and he was sure that those in Bombay would be most grateful to the shareholders for having passed the vote of thanks.

The Secretary expressed cordial thanks on behalf of the staff both at home and overseas.

The meeting then closed.

Reduction in Price at Congleton.—The Gas Committee of the Congleton Town Council have reduced the price of gas from 3s. 6d. to 3s. 4d. per 1000 c.ft., to take effect from April 1.

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

There have been day-to-day ups and downs in the market, but no general change in the situation. For instance, Durham coking, which had been in slightly better demand in the previous week, has been again lacking in interest. Best Northumberland steams are said to be responding slightly to the curtailed output, and collieries fairly well stemmed for the next week or two. Gas makes are in moderate demand only, and producers are generally willing to offer substantial discounts on quoted prices for prompt tonnage.

Prices nominally are 19s. 6d. f.o.b. for Wear Specials, and 19s. 3d. to 19s. 6d. for best qualities. Some brands are obtainable at 18s. 6d. for tonnage that suits the colliery position, or through contractors who hold the coal. Seconds and others are 16s. 9d. to 17s., and are in plentiful supply.

The outlook is as black and unsettled as ever. Collieries are still closing down, and competition on the Continent continues unabated. Home demand shows no signs of improving, and it is difficult to know where to look for any change in the future.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

There is no material alteration in the market conditions this week. House coal remains steady for the time of the year, and some of the best-known descriptions are not available for dispatch under two or three weeks. Slight reductions have been made in some directions, but there is no general lowering of prices.

The outlook in regard to gas coal is rather uncertain. A peculiar feature of this market is that many of the gas concerns have decided to buy for a period of twelve months some two or three months before the first deliveries will be made. Prices are ruling at a reduction compared with last year, and it may be that the purchasers are considering the getting price of the coal, which in West Yorkshire is more than the pit prices which the gas companies are being asked to pay.

The industrial consuming trades still remain dull, with few indications of an improvement in the immediate future, with the result that "spot" lots of the commoner grade slacks and nuts are being offered at comparatively low figures; but these are not being taken advantage of to any great extent owing to contract commitments.

The export situation continues dull, with no immediate prospect except at figures which show a great loss to the producer.

Prices at Hull at the week-end were: South Yorkshire—Hards, Association, 20s.; screened gas coal, 18s. 6d. to 19s.; washed trebles, 20s.; washed doubles, 17s. to 17s. 6d.; washed singles, 17s.; washed smalls, 13s. to 13s. 3d.; rough slack, 11s.; smithy peas, 19s. to 20s. 6d. West Yorkshire—Hartleys, 17s. to 18s.; screened gas coal, 18s.; washed trebles, 19s.; washed doubles, 17s.; washed singles, 16s. 6d.; washed smalls, 12s.; unwashed trebles, 17s. 6d. to 18s.; unwashed doubles, 13s. to 13s. 6d.; rough slack, 10s. 6d. to 11s.; coking smalls, 9s. 6d. Derbyshire and Notts—Tophards, 19s. to 20s.; washed trebles, 17s. 6d. to 18s. 6d.; washed doubles, 17s. to 17s. 6d.; washed singles, 16s. 6d. to 17s.; washed smalls, 12s. 6d.; unwashed doubles, 14s. to 15s.; rough slack, 10s. 9d. to 11s. Yorks, Derby, and Notts—screened steam coal, 15s. to 17s.; gas coke, 21s. 6d. to 26s. 6d.; furnace coke, 17s. to 17s. 6d.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

The market position continues to deteriorate. Soundings are proceeding with a view to the new annual contracts for supplies of gas coal. Buyers are in no hurry to come to terms, however, as they believe the economic position will give them further advantages before current engagements expire. Many of the undertakings have, of course, large commitments to fulfil under existing contracts, and these render them more independent. As regards the general industrial and household branches, values have given way further in seconds and common grades; supplies being offered at a shilling less.

The diminution in the output of nuts and beans and slacks has not sufficed to maintain the improved prices lately noted. Sellers have been glad to do business at from sixpence to a shilling reduction. At the Birchenwood Colliery in North Staffordshire, overtures have been made to the miners with a view to a co-operative scheme for keeping the concern going. A large part of the output has hitherto been coked; but owing to the uneconomic price to which coke has fallen, eighty-four ovens have been closed down for some time past, and the management regard the position as so serious that, pending the formulation of some scheme to avert total stoppage, they have decided to put their workmen, numbering nearly 3000, on a day-to-day contract of employment.

The cancellation of foreign orders has thrown large supplies of coke back on to the home market; and at present there is no sign of its recovery from the demoralization, blast-furnace sales being more difficult to negotiate than ever.

Keighley's Gas Centenary.—This month the Keighley gas undertaking celebrates its centenary. In May, 1825, the erection of the first works, at Low Bridge, was commenced, and in November of the same year the town was lighted by gas. It has been a public undertaking all the time, Keighley being one of the first towns in the country to have gas from works erected by the local authority. The Improvement Commissioners were instituted in the town in 1824, and the establishment of the gas-works during the following year was one of their first activities. The present works at Thwaites were opened in 1876.

TRADE NOTES.

A New Holmes Catalogue.

Messrs. W. C. Holmes & Co., Ltd., of Huddersfield and London, have sent us a copy of the first section of a new catalogue which they are issuing. This section contains information relating to various types of air and water cooled condensers, and particularly the Bournemouth or "super" type condenser, as supplied recently to the Fulham Station of the Gas Light and Coke Company, and the gas-works at Bournemouth, Swansea, Cambridge, Southampton, Torquay, &c. Further sections dealing with tar extractors, rotary and centrifugal washers, gas valves, purifiers, and gasholders, and chemical works equipment are in course of preparation.

CONTRACTS OPEN.

Fireclay Goods.

The Gas Department of the County Borough of Burnley are inviting tenders for fireclay retorts, bricks, and clay required for the resetting of ten beds of sixes, 15 ft. inclines. [See advert. on p. 389.]

Coal.

Tenders are invited by the Bingley Urban District Council for the supply of 6000 tons (or, alternatively, 12,000 tons) of gas nuts. [See advert. on p. 389.]

The Gas Committee of the Borough of Newcastle-under-Lyme are inviting tenders for 8000 tons of double screened and washed gas nuts. [See advert. on p. 389.]

EXTENSIONS.

Aberdeen Gas-Works.

The purchase by the Aberdeen Corporation Gas Department, at a cost of £523, of a boosting plant was recommended at a meeting of the Gas Committee of the Town Council last week. It was agreed to lay mains in Cattofield Place, and the mains in Broomhill Road and Westburn Drive are to be extended.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *May* 4.

There is little movement in pitch, and the price remains nominal at 41s. to 42s. per ton at makers' works.

Creosote is quiet at about 7d. per gallon net and naked.

Pure benzole and pure toluole are firm at about 1s. 10d. per gallon.

Solvent naphtha (95/160) is about 1s. 8d. per gallon.

Tar Products in the Provinces.

May 4.

The average values for gas-works products during last week were: Gas-works coal-tar, 27s. 9d. to 32s. 9d. Pitch, East Coast, 40s. to 41s. f.o.b. West Coast—Manchester, 35s. to 36s.; Liverpool, 36s. to 37s.; Clyde, 39s. to 40s.; Benzole, 90 p.ct., North, 1s. 7½d. to 1s. 8½d.; crude, 65 p.ct., at 120° C., 11d. to 1s. 1d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 7½d. to 1s. 8½d. Toluole, naked, North, 1s. 6½d. to 1s. 7½d., nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8½d. Solvent naphtha, naked, North, 1s. 5d. to 1s. 6d. Heavy naphtha, North, 1s. to 1s. 2d. Creosote, in bulk, North, liquid, 6d. to 6¼d.; salty, 5⅝d. to 6½d.; Scotland, 5⅝d. to 6d. Heavy oils, in bulk, North, 6½d. to 7d. Carbolic acid, 1s. 5d. to 1s. 6d. prompt. Naphthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality 2½d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

British Legion.—The annual report and accounts of the British Legion for 1924 have just been published, from which it is seen that the work of the Legion throughout the country on behalf of disabled men, widows, and dependants has increased during the year. During the period under review, nearly 60,000 first claims to pension were made to the Ministry, of which only 18,000 were admitted. This will give an indication of the need for an organization with the machinery and information available for the assistance of these claimants. In addition there are 600,000 officers and men in receipt of pension, over 160,000 widows, and 330,000 fatherless children. Further, six years after the Armistice, there are still 12,000 men receiving treatment in hospital. At least 500,000 cases are dealt with by the Legion's machinery every year.

Chester United Gas Company.—At the annual meeting of the employees of the Company who are shareholders under the co-partnership scheme Mr. J. P. Gamon presided. In proposing the adoption of the report and accounts for the year ended Dec. 31, the Chairman said it was a particular pleasure to meet them that day, because it was his father (then Chairman of the Company) who initiated the principle of co-partnership into the Company in 1901 by the introduction of a profit-sharing scheme. The scheme was started when a reduction in the price of the gas was confidently expected; and in the first year of operation a bonus of 3 p.ct. on salaries and wages was earned. In 1906 the scale of bonus and some rules were revised; but despite this, in 1913 the bonus had risen to 7½ p.ct. The war was not long in imposing its effect on industrial costs, and the bonus was reduced until it ceased altogether in 1918, when the price of gas was raised above 3s. 4d. per 1000 c.ft. There was no need for him to refer to the details of the new co-partnership scheme. It was highly satisfactory that the same rate of bonus as was declared in 1923—6½ p.ct.—was maintained for the year 1924, because financial conditions in the latter year were not so favourable. Nearly half the employees were now owners of stock in the Company, and the aggregate amount so held was over £2500, in addition to £1600 held by the trustees in readiness for transfer to individual co-partners now that the 1924 bonus was available.

STOCK MARKET REPORT.

THE return to the Gold Standard was perhaps the most important part of the Budget from the Stock Exchange point of view, as, though the change was expected, the actual announcement brought about a fear of increased gold exports and a consequential rise in the Bank Rate. Realizations of gilt-edged securities by nervous holders caused some shrinkage in quotations.

The Foreign Market continued in a depressed condition. The German Presidential election result, and the indefiniteness of the French Government's intentions with regard to that country's finances, doubtless contributed to this, and dealings were unimportant.

The misunderstanding over the Chancellor's intentions with regard to the duty to be imposed on silk caused some excitement on the "Street." Under the impression that a protective duty was to be imposed, artificial silks were in great demand. Courtaulds rising to 10os.; but on the truth becoming known the shares fell away to 96s. 6d. Motor shares responded to the proposed resumption of the McKenna duties. Humbers were particularly strong, rising to 37s. 6d. It remains to be seen, however, whether the loss of business, which chairmen of companies reported as a result of the removal of the duties, will be recovered.

There was a reactionary tendency in South African gold shares, the return of the sterling exchange to parity causing a loss of income to the producers.

In the Gas Market there is little to record. Quotations are still inclined to fall; but it is not anticipated, having regard to the improvement that is probable by reason of the reduced rate of income-tax, that this will continue, except perhaps in isolated cases where there have been few transactions of late. An exception to the rule is a rise of 1 point in the Sheffield stocks on the home Exchange. British ordinary dropped 2 points, to 110-115; Croydon sliding-scale 1½ points, to 98-102, and Gas Light ordinary a further 1, to 84-86. An issue of £12,000 5 p.ct. Perpetual Debenture stock at a minimum price of £95 has been announced by the Hayward's Heath District Gas Company.

The following transactions were recorded during the week:

On Monday, Alliance and Dublin 66¾, Bombay 5⅜, European 7⅛, 7¼, Gas Light and Coke 85¼, 85⅜, 86, 3 p.ct. debenture 60⅝, 61½, Imperial Continental 179, 181, Montevideo 66, Newcastle 3½ p.ct. 79⅛, Oriental 104½, 105, Primitiva 10s., 4 p.ct. debenture 1911 6½, South Metropolitan 94½, 95, 3 p.ct. debenture 60½, 61. Supplementary prices, Brentford 7½ p.ct. mortgages 101, Dover 5¼ p.ct. debenture 102½.

On Tuesday, Bombay 5⅞, British 111, Commercial 4 p.ct. 86⅞, Continental Union 35⅞, 35⅝, 36, European 7, Gas Light and Coke 85, 85⅛, 85⅜, 4 p.ct. preference 70, Imperial Continental 180½, 181, Primitiva 9s. 9d., 10s., South Metropolitan 94¼, 94⅝, 6½ p.ct. debenture 103½. Supplementary prices, Croydon 7½ p.ct. preference 101½, 101⅞, Grays and Tilbury "B" 8⅝, 8¾, Wandsworth 3½ p.ct. new 96½.

On Wednesday, Alliance and Dublin 66, 66⅞, Bombay 5⅛, 5⅜, 5¼, Commercial 4 p.ct. 86⅛, Gas Light and Coke 84⅞, 85, 85⅛, 85⅜, 85⅝, 85⅞, 3½ p.ct. maximum 63⅜, 4 p.ct. preference 70¾, 3 p.ct. debenture 60⅜, 61, Imperial Continental 181½, 181⅞, Primitiva 9s. 9d., 10s. 1¼d., South Metropolitan 94⅞, Tottenham "A" 118, Supplementary prices, Dover 5¾ debenture 102½, Southgate and District 5 p.ct. debenture 98½, Sunderland 6 p.ct. maximum 104.

On Thursday, Alliance and Dublin 66⅞, Continental Union 7 p.ct. preference 88, Croydon sliding-scale 100, 101, Gas Light and Coke 84⅞, 84½, 84⅞, 85, 85⅛, 4 p.ct. preference 70½, Imperial Continental 180¾, 181⅛, South Metropolitan 94, Wandsworth, Wimbledon 5 p.ct., 105.

Conditions in Lombard Street became quite comfortable with the turn of the month; the distribution of nearly £50,000,000 in dividends and other payments assisting the position. There was no keen demand for money; and while 3½ p.ct. was paid for overnight advances balances were ultimately available at 3 p.ct. The fear of a higher Bank Rate showed itself in the rate at which Treasury Bills were allotted, the average being 3s. 7d. p.ct. above the previous week's average, or £4 8s. 4½d. p.ct.

The gold standard assisted sterling, a fresh record being created; the final quotation on New York being 4.84⅝. French francs were a little stronger, and closed at 92.42½. Belgian francs closed at 95.52½, and Italian lire were finally lower at 117.62½.

There was a firmer tone in the Silver Market, and the cash price rose to 31⅝d. per oz. Gold remained at 84s. 11½d. per oz.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on March 5. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3¼ p.ct. at notice.

£	Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. May 1.	Rise + or Fall — on Week.	Transactions Lowest and Highest Prices.
	£			% p.a.	% p.a.				
	171,978	Stk.	Feb. 5	5	5	Aldershot 5 p.c. max. C.	78—81	..	..
	295,492	,,	,,	4	4	Do. 4 p.c. Pref.	71—76	..	..
	1,351,868	,,	Apl. 2	6½	6½	Alliance & Dublin Ord.	66—71	..	66—66⅞
	374,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb.	63—68	..	..
	300,000	5	Oct. 23	8	8	Bombay, Ltd.	5—5⅛	..	5⅛—5⅜
	100,000	10	Mar. 5	8½	8½	Bournemouth 5 p.c.	12—13	..	..
	425,050	10	,,	7	7	Do. B 7 p.c.	12½—12⅞	..	..
	150,000	10	,,	6	6	Do. Pref. 6 p.c.	12—12	..	..
	50,000	Stk.	Jan. 8	3	3	Do. 3 p.c. Deb.	56—59	..	..
	162,025	,,	,,	4	4	Do. 4 p.c. Deb.	76—79	..	..
	992,045	,,	Mar. 5	6 7/16	6 7/16	Brentford A Com.	93—105	..	..
	990,500	,,	,,	6⅜	6⅜	Do. B New	95—105	..	..
	76,000	,,	,,	5	5	Do. 5 p.c. Pref.	95—98	..	..
	306,690	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	76—81	..	..
	181,337	,,	,,	6	6	Do. 6 p.c. Rich. Red. Deb.	100—105	..	..
	214,740	,,	Mar. 5	11⅛	12½	Brighton & Hove Orig.	165—170	..	..
	244,200	,,	,,	8½	9½	Do. A Ord.	122—125	..	..
	1,285,500	,,	Feb. 19	8	5	Bristol 5 p.c. max.	96½—97⅛	..	..
	855,000	,,	Mar. 19	8	7	British Ord.	110—115	—2	111
	100,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref.	123—128	..	..
	120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	72—77	..	..
	100,000	10	Dec. 18	8	6	Cape Town, Ltd.	7—8	..	..
	100,000	10	Apl. 23	4½	4½	Do. 4½ p.c. Pref.	6—7*	..	..
	150,000	Stk.	Dec. 18	4½	4½	Do. 4½ p.c. Deb.	71—76	..	..
	626,860	,,	Feb. 19	6	6	Cardiff Con. Ord.	101—104	..	..
	237,860	,,	Jan. 8	7⅛	7⅛	Do. 7½ p.c. Red. Deb.	104—107	..	..
	257,150	,,	Feb. 19	5	6⅛	Chester 5 p.c. Ord.	89½—94½	..	..
	1,513,280	,,	Mar. 5	6	5/14/8	Commercial 4 p.c. Cap.	86—89	..	86½—86⅝
	560,000	,,	,,	6	5⅜	Do. 3½ p.c. Cap.	86—89	..	..
	475,000	,,	Dec. 18	3	3	Do. 3 p.c. Deb.	57—60	..	..
	800,000	,,	14 Jan. 15	—	—	Continental Union, Ltd.	35—40	..	35⅜—36
	200,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref.	88—92	..	88
	660,000	,,	Mar. 5	6½	6½	Croydon sliding scale	98—102	—1½	100—101
	284,975	,,	,,	5	5	Do. max. div.	83—86	..	..
	492,270	,,	Feb. 19	6	9	Derby Con.	110—112c	..	..
	55,000	,,	Jan. 8	4	4	Do. Deb.	74—76c	..	..
	1,002,180	I	Jan. 22	6	4	European, Ltd.	7—8	..	7—7⅛
	1,400,070	Stk	Feb. 19	5½	5⅜	Gas Light & Coke 4 p.c. Ord.	84—86	—1	84⅛—86
	2,600,000	,,	,,	3⅛	3⅛	Do. 3½ p.c. max.	62—65	..	63⅛
	4,062,235	,,	,,	4	4	Do. 4 p.c. Con. Pref.	78—80	..	79—79⅛
	4,761,930	,,	Dec. 18	3	3	Do. 3 p.c. Con. Deb.	59—62	..	60⅜—61⅛
	130,000	,,	—	10	10	Do. 10 p.c. Bonds	..	..	..
	42,000	,,	—	7⅛	7⅛	Do. 7⅛ p.c. Ilford Deb.	..	..	..
	82,500	,,	Mar. 19	6⅛	6⅛	Hastings & St. L. 5 p.c. Conv.	92—97	..	..
	258,740	,,	,,	5⅛	5⅛	Do. 3½ p.c. Conv.	73—78	..	..
	70,000	10	Sept. 25	10	10	Hongkong & China, Ltd.	16—17	..	..
	86,600	Stk.	Mar. 5	10	10	Horsley 7 p.c.	140—143	..	..
	1,076,000	,,	Nov. 20	30	10	Imperial Continental Cap.	179—184	..	179—181⅛
	263,950	,,	Feb. 5	3⅜	3⅜	Do. 3½ p.c. Red. Deb.	71—74	..	..
	235,242	,,	Mar. 19	6⅛	6⅛	Lea Bridge 5 p.c. Ord.	96—101	..	..
	2,127,340	,,	Feb. 19	5⅛	5⅛	Liverpool 5 p.c. Ord.	87—886	..	..
	600,000	,,	Mar. 19	7	7	Do. 7 p.c. Red. Pref.	103⅛—104⅛b	..	..
	165,736	,,	Feb. 19	9	8	Maidstone 5 p.c. Pref.	122—132	..	..
	63,480	,,	Dec. 18	3	3	Do. 3 p.c. Deb.	54—59	..	..
	75,000	5	Dec. 4	7	5	Malta & Mediterranean	4⅛—4⅜	..	..
	541,920	Stk.	Nov. 20	4	4	Montevideo, Ltd.	62—67	..	66
	2,061,315	,,	Mar. 5	5	5	Newcastle & Gateshead Con.	78⅛—79⅛d	—⅛	79⅛
	300,929	,,	,,	4	4	Do. 4 p.c. Pref.	72⅜—73⅛d	..	..
	529,705	,,	Dec. 18	3⅛	3⅛	Do. 3½ p.c. Deb.	68⅛—69⅛d	..	..
	15,000	10	Mar. 5	11	12	North Middlesex 10 p.c.	..	..	..
	75,940	10	,,	7 7/16	8⅜	Do. 7 p.c.	..	..	..
	300,000	Stk.	Dec. 4	7	9	Oriental, Ltd.	102—107	..	104⅛—105
	188,120	,,	Jan. 8	7⅛	7⅛	Plymouth & Stonehouse 5 p.c.	109—114	..	..
	60,000	50	Mar. 5	13	14	Portsea Island B	90—99	..	..
	100,000	50	,,	12	13	Do. C	93—98	..	..
	2,289,909	I	—	—	—	Primitiva Ord.	9/9—10/9	—/3	9/9—10/1⅛
	311,100	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb.	79—81	..	..
	600,000	Stk.	Jan. 22	4	4	Do. 4 p.c. Red. Deb. 1911	63—65	..	63⅛
	220,335	,,	Dec. 18	4	4	Do. B. Aires 4 p.c. Red. Db.	55—67	..	..
	321,670	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	65—67	..	..
	150,000	10	Mar. 19	6	6	Sao Paulo 6 p.c. Pref.	7⅜—8⅛	..	..
	125,000	50	Jan. 2	5	5	Do. 5 p.c. Red. Deb.	43—40	..	..
	270,000	Stk.	Mar. 19	5⅛	5⅛	Sheffield A	103—105e	+1	..
	419,968	,,	,,	5⅛	5⅛	Do. B	103—105e	+1	..
	1,047,000	,,	,,	5⅛	5⅛	Do. C	103—105e	+1	..
	90,000	10	Oct. 23	8	6	South African	7—9	..	..
	6,609,895	Stk.	Feb 19	5	6⅛	South Met. Ord.	91—96	..	94—95
	1,895,445	,,	Jan. 8	3	3	Do. 3 p.c. Deb.	50—62	..	60⅜—61
	734,000	,,	Mar. 5	6⅛	6⅛	Do. 6½ p.c. Red. Deb.	102⅜—104⅜	..	103⅛
	91,500	,,	Mar. 5	8⅛	8⅛	South Shields Con.	135—136d	..	..
	1,187,795	,,	Feb. 19	6⅛	6⅛	South Suburban Ord. 5 p.c.	97—102	..	..
	368,837	,,	Dec. 18	5	5	Do. 5 p.c. Deb.	97—100	..	..
	647,740	,,	Nov. 6	5	5	South'mpt'n Ord. 5 p.c. max.	83—86	..	..
	121,275	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	72—77	..	..
	250,000	,,	Mar. 5	7	7	Swansea 7 p.c. Red. Pref.	102⅛—103⅛	..	..
	200,000	,,	Dec. 18	6⅛	6⅛	Do. 6½ p.c. Red. Deb.	103—105	..	..
	120,000	,,	Feb. 19	8	8	Tottenham District A 5 p.c.	116—119	..	118
	882,275	,,	,,	6⅛	6⅛	Do. B 3½ p.c.	98—101	..	..
	181,255	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	75—79	..	..
	258,251	,,	Mar. 19	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, & Wycombe 5 p.c.	77—79d	..	..
	197,294	,,	Feb. 19	6⅛	6⅛	Do. 5 p.c. pref.	100—105	..	..
	88,330	,,	,,	5	5	Do. 5 p.c. Maidenh'd	95—100	..	..
	91,800	,,	,,	—	6⅛	Wandsworth, Wimbledon, and Epsom—	90—95	..	..
	30,000	,,	Mar. 5	9⅛	9⅛	Wandsworth A 5 p.c.	130—135	..	..
	255,636	,,	,,	7⅛	7⅛	Do. B 3½ p.c.	110—115	..	..
	392,955	,,	,,	6/9/6	6/9/6	Do. C and New	95—100	..	96⅛
	552,000	,,	,,	7⅛	7⅛	Wimbledon 5 p.c.	105—110	..	105
	98,000	,,	,,	7⅛	7⅛	Epsom 5 p.c.	115—120	..	..
	88,416	,,	Dec. 18	3	3	3 p.c. Deb.	57—60	..	..

Quotations at:—*a*,—Bristol, *b*,—Liverpool, *c*,—Nottingham, *d*,—Newcastle, *e*,—Sheffield. * Ex. div.

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Birmingham Gas Department.—In the "JOURNAL" for April 5, p. 189, it was mentioned that the Gas Committee, in a report presented to the City Council on April 7, recommended the purchase of six small motor cars for the use of meter inspectors. The motion as carried; and Wolseley cars are to be provided.

L.C.C. and the South Metropolitan Gas Bill.—Acting under the authority of the London County Council, the Parliamentary Committee caused a petition to be deposited against the South Metropolitan Gas Bill; and they are in negotiation with the promoters with a view to a settlement, if possible, of satisfactory amendments.

Rotherham Gas-Works.—In his report of the undertaking for the year ended March 31, Mr. J. S. Naylor, the Engineer and Manager of the Rotherham Corporation Department, says the quantity of coal carbonized was 9291 tons, at a cost of £10,524, as against 8847 tons last year, costing £7741. The quantity of gas sold was 22,448,000 c.ft., or 1,612,240 therms, compared with 309,682,000 c.ft., or 1,548,410 therms. The net profit was £2459, which figure compares with £4797.

Coal Contracts at Stoke-on-Trent.—The Stoke-on-Trent Town Council, at their last meeting, passed the following resolution, which was submitted by the Gas Committee: "That on the conclusion of the existing contracts for coal, and before an order for coal or fuel of any kind is given in the future to any colliery company or agent, tenders therefor shall be advertised, and all particulars of such transactions, including prices and tests made by the Gas Engineer, shall be submitted and approved by this Committee."

Exhibition at Worthing.—Last week the Worthing Gas Light and Coke Company held an exhibition at the Rivoli Hall, Worthing. A wide range of gas appliances was shown, and there was also a demonstration of the bye-products recoverable from coal by distillation. The exhibition was the first of its kind to be held in Worthing, and it reflects great credit on the Gas Company for their enterprise, and on Mr. E. T. Hewitt, the District Superintendent of the Company, for his ingenuity in arranging the exhibits. All the fitting necessary in connection with the exhibition was done by employees of the Company.

L.C.C. and the Gas Light and Coke Company's Bill.—The Parliamentary Committee (No. 2) report to the London County Council that, acting under the authority of the Council, they caused a petition to be deposited against the Gas Light and Coke Company's Bill. In consequence of this opposition, and the opposition of a number of other petitioners, the clauses which sought to enable the Company to supply power gas and to lay mains and pipes for such purpose were withdrawn. In connection with the provision enabling the Company to stop up a footpath which leads from North Woolwich and Gallions Railway Station through the Company's works at Beckton to the Council's northern outfall works, a clause was agreed to with the promoters to enable persons proceeding to the outfall works still to use the footpath, and to preserve the right of the Council to maintain the sewage pumping mains now existing thereunder. A clause was also agreed for the protection of the Council under the London Building Acts in regard to various proposals contained in the Bill. In the circumstances, it was not necessary for further action to be taken on the Bill.

New Capital Issues.—Messrs. A. & W. Richards, of No. 37, Walbrook, E.C., are offering for sale by tender £10,000 of 5½ p.ct. perpetual debenture stock in the York Town and Blackwater Gas Company, at the minimum price of par. Tenders must be sent in by Tuesday morning, May 12. They are also similarly offering £20,000 of 5 p.ct. irredeemable preference stock in the Guildford Gas Light and Coke Company. The minimum price of issue is £90 per £100; and, as will be seen from an advertisement on another page, tenders have to be sent in by Thursday morning, May 14. Both the North Middlesex and Littlehampton Gas Company issues by the same firm were over-subscribed. For the £10,000 of additional ordinary stock of the North Middlesex Gas Company, the prices ranged from £122 down to the minimum of £117 10s. per £100. In the case of the Littlehampton Gas Company, the prices for the £5000 of 6 p.ct. redeemable debenture stock ranged from £104 down to the minimum of par.

During the year ended March 31, the sales of gas by the Dewsbury Gas Department were increased by 24,700,000 c.ft.

Permission has been granted by the Public Control Committee of the London County Council for the Association of Statutory Inspectors of Gas Meters to visit the Finsbury gas meter testing office on June 10.

The Coroner's jury returned a verdict of "Accidental death" at an inquest held recently at Burton-on-Trent on Mrs. Burgess and George Farndale, of Horninglow Street, who were poisoned by an escape of gas from an old and defective fitting.

From last Monday, the London address of Messrs. Williamson, Cliff, Ltd., is No. 1, Central Buildings, Tothill Street, Westminster, S.W. 1; and their telephone numbers Victoria 6505 and 6506. Samples of the goods the firm manufacture will be open for inspection at any time that readers of the "JOURNAL" can make it convenient to call.

The Housing Committee of the London County Council have accepted an offer of the Tottenham District Light, Heat, and Power Company to carcase dwellings on the White Hart Lane estate for lighting and cooking, and to supply a gas installation, free of cost to the Council, except that tenants must provide incandescent burners.

On Tuesday last week there was an unusual occurrence in Birmingham—the explosion of an acetylene cylinder, due to a fire arising on a motor lorry. The result was injury to five persons. The cylinder was in the driver's cabin of the lorry; and at the time of the explosion the firemen had the fire well under control. As the flames were being subdued, the crowd closed upon the lorry; and it was then that the explosion occurred.

A Building and Allied Trades Exhibition, organized by the Birmingham Chamber of Commerce, will be held at Bingley Hall, Birmingham, from Sept. 7 to 19. The object is to stimulate progress in matters relating to house building, town planning, road construction, &c. The schedule includes electrical, gas, oil, and other illuminating and heating plant and fittings. The Lord Mayor of Birmingham is the President, and among the Vice-Presidents is Councillor John Thacker (President of the Birmingham and District Master Gasfitters' Association).

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

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See Illustrated Advertisement, April 8, p. 144.

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JOHN RILEY & SONS, Limited, Chemical Manufacturers, Hapton, near Burnley, are MAKERS of Special SULPHURIC ACID ("Eagle" Brand), for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 60 years. Reference given to Gas Companies

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Manufacturers of
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"FALCON" INVERTED LAMPS,
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SUPERHEATER BURNERS, and
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SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
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FOR Gas Works Plant of Every Description; also SULPHATE OF AMMONIA and SULPHUR RECOVERY PLANTS.
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WHEN Filling Vacancies, please REMEMBER THE CLAIM OF THE EX-SERVICE MAN, who, other Qualifications being equal, HAS THE FIRST CALL ON YOUR CONSIDERATION.

WEYMOUTH CONSUMERS' GAS COMPANY.

APPLICANTS for the Positions of Gas FITTERS ARE THANKED for their Applications. THE VACANCIES ARE NOW FILLED.
J. T. Joyce,
Engineer and Manager.

WARRINGTON CORPORATION.
(Gas Department.)

APPLICATIONS are invited for the position of ASSISTANT ENGINEER and MANAGER.
Candidates (who must not be more than 35 Years of Age) must possess a thorough knowledge of Carbonization, Engineering Workshop Practice, and the Working-Up of Residuals, and must be able to Prepare Drawings and Specifications. A knowledge of Distribution is also desirable.
The Appointment will be subject to the provisions of the Local Government and Other Officers' Superannuation Act, 1922.
Salary £350 per Annum, rising by two Annual Increments of £50 to £450.
Applications, stating Age, Training, and Experience, whether Married or Single, and accompanied by *copies* of not more than Three recent Testimonials, to be addressed to the Chairman of the Gas Committee, Town Hall, Warrington, and endorsed "Assistant Engineer."
Applications to be received not later than Thursday, May 21, 1925.
A. T. Hallaway,
Town Clerk.
Town Hall,
Warrington.

BRIDGNORTH GAS-WORKS.

GAS MANAGER WANTED.

THE Gas Committee of the Bridgnorth Corporation require the Service of a Properly Qualified and Experienced GAS-WORKS MANAGER, as soon as possible.
Applications, in own handwriting, stating Age, Experience, and Salary required, accompanied by *copies* of Three Testimonials, to be sent to the undersigned not later than Saturday, the 9th of May, 1925.
House, rent free, with Coal and Gas will be provided.
J. H. Cooksey,
Town Clerk,
and Secretary to the Gas Department.
Bridgnorth,
April 23, 1925.

COUNTY BOROUGH OF BURNLEY.
(Gas Department.)

APPLICATIONS are invited for the Position of SHOWROOM MANAGER and INTERNAL FITTINGS INSPECTOR in the above-mentioned Department.
The commencing Salary will be £307 per Annum, and will be governed by the Corporation's Grading Scheme, Grade D.1, which has at the present time a maximum of £351. These amounts include Bonus, which Bonus is liable to fluctuation in accordance with the cost of living figure.
Applicants must have had previous Experience in this class of work.
Form of Application, with Conditions of Appointment, must be obtained from the Gas Engineer, Gas-Works, Burnley.
Applications must reach the Gas Engineer, Burnley, on or before Wednesday, the 13th of May, endorsed "Gas Showroom Manager."
Colin Campbell,
Town Clerk.
Town Hall, Burnley,
April 25, 1925.

WANTED—an experienced Draughtsman. Knowledge of Gas-Works Practice desirable. Commencing Salary, £252 per Annum, less Superannuation Deduction.
Apply to the undersigned, stating Age, Qualifications, and Experience.
John H. Chew,
Engineer and Manager.
Gas-Offices,
Princess Street,
Blackpool,
April 24, 1925.

WANTED—An Experienced Inspector practically Trained in the fixing and Use of all Gas Apparatus, able to control Workmen and cultivate Business.
Apply, stating Age, Experience, and Salary required, to No. 7539, "Gas Journal," 11, Bolt Court, Fleet Street, E.C. 4.

WANTED, by a Provincial Gas Company, a Thoroughly Competent METER TESTER for Repair Shop.
Apply, stating Experience, References, Age, and Wages required, to No. 7542, "Gas Journal," 11, Bolt Court, Fleet Street, E.C. 4.

GAS Fitter wanted, must have s all-round Experience in Fixing Fires, Ge &c., and General Maintenance Work. District re Wages paid.
Apply, Stating Age, Experience, &c., to the Man. Littlehampton Gas Company, Littlehampton.

PLANT, &c., FOR SALE & WANT

GAS PLANT IN STOCK.

PURIFIERS.—Dry lutes, 10 ft. and 10 ft. by 8 ft. Also 8 ft. sq. and 10 ft. by
Condensers.—6 in. and 8 in. Vertical Pipe densers. Also Patent Baffle Plate Condenser
Livesey Washer.—6 in., 8 in. and 10 in. nections.
Tower Scrubbers.—10 by 70, 4½ by 18, 4½ by
Exhausters.—2000 to 50,000 c.ft. per hour ca
Station Meters.—4 in., 6 in. and 8 in. Co tions. Also 100 lt. and 200 lt. Meters.
Station Governors.—4 in., 6 in., 6 in. and
Gasholder and Steel Tank.—10,000 cap
Also in stock PUMPS, TANKS, VALVES, CAS IRON PIPES, TUBING, &c.
Send us your inquiries.
Firth Blakeley, Sons, & Co., Ltd.
(Second-hand Plant Depts.),
Church - Fenton, Yorks.

STEAM-BOILERS For Sale—All Si Vertical. Loco-type, Cornish, Portable, and Types of Boilers.
Apply
Grantham Boiler & Crank Co., Ltd., Grante

FOR Sale—Double Riveted Cochr Vertical BOILER, 13 ft. 6 in. by 6 ft., 1919. able for Water Gas Plant.
Full particulars from the Gas Engineer, M cambe.

FOR SALE— Complete Sets of RETORT BENCH I WORK.
Bates and Sons, Wigston Lane, Aylest Leicester.

FOR SALE—One Set of Gas Exha ING PLANT, made by the Bryan Donkin pany, Limited.
The Exhauster is capable of passing 75,000 feet per hour at 85 revs. per minute, against a gas sure of 30 in., and is coupled direct to a Horiz Steam Engine, 10 in. diameter by 14 in. stroke, wo with 60 lb. steam pressure, complete with Inle Outlet Screw-Down Valves and Hydraulic Steam lator and Equilibrium Steam Throttle Valve.
The above plant is one of Three Sets which is replaced by Three very large Sets by the same m It is in first-class condition, and can be seen run by appointment with Mr. H. Pooley, at the Ayle Road Gas-Works, Leicester.

FOR SALE BY PRIVATE TREATY.

OFFERS are invited for follow nearly new, GAS ENGINE PLANT:
One 335-b.h.p. WESTINGHOUSE VERT TANDEM (2 crank) 4 cylinder, installed 300 r.p.m. Run only 1700 hours.
One 150-b.h.p. RICARDO, 6 cylinder, 1000 r installed 1923. Run only 350 hours.
One 150-b.h.p. RICARDO, 6 cylinder, 1000 (Spare engine.)
Please write to the Electrical Engineer, A shot Gas, Water, and District Lighting Com Lynchford Road, South Farnborough.

SEDGELEY URBAN DISTRICT COUNC
(Gas Department.)

THE above Council have for disp a COMBINED STEAM ENGINE and RO EXHAUSTER, Capacity 10,000 c.ft. per hou Waller and Son.
The above is in perfect Condition and can be Working. Replacing by a larger one.
For Particulars, apply to the Undersigned, Gas-Works, Lower Gornal.
Joseph Brettle,
Engineer and Mana

DEMOLITION OF PLANT.

EDINBURGH CORPORATION.
(Gas Department.)

THE Magistrates and Council prepared to receive OFFERS for the DE LITION and REMOVAL of four GASHOL having Cast-Iron Columns with Lattice Girders of one SUBMERGED CAST-IRON GASHOL TANK, all situated on their property at Ta Canonmills.
Permission to inspect and all further Particulars be obtained on Application to the Undersign whom Offers should be addressed.
The Magistrates and Council are not bound to a the lowest or any Offer.
(Signed) H. H. Gracie,
Engineer and Mana
15, Clinton Hill,
Edinburgh,
April 30, 1925.

GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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VOL. CLXX., No. 3235.] WEDNESDAY, MAY 13, 1925. [77TH YEAR.

EDITORIAL NOTES.

The Wembley Reopening.

THE British Empire Exhibition sprang into life again last Saturday; and it seemed almost impossible, as we wandered along the well-known paths and through the same buildings which afforded so much delight and information to millions of people last year, that it had all been dormant during the long dreary winter through which we have passed. There were the huge buildings of variegated architectural design, with their white exteriors looking as clean and new as in their primal state, there were the lawns and gardens exceeding in beauty their appearance last year, the paths (better surfaced) were filled with people, the lakes were alive with boats with their occupants of joy-gleaning folk; the air was filled with music. Some 121,000 visitors passed the turnstiles; and everyone seemed glad that the great exhibition was again open. If the evidence of popularity at the reawakening continues, there will have to be consideration as to whether Wembley has not become a permanent Imperial institution. But that is a matter for the future; sufficient for the present is the Wembley of to-day. Not only in the glorious sunlit grounds but in the buildings the people were found in large numbers investigating what was to be seen; and from what one witnessed of their interest and enthusiasm everywhere, it was clear that it was not only the pageantry of the morning and the ceremony of reopening by the King-Emperor, accompanied by the Queen, that had attracted them, but men and women of all conditions and places in our social system were giving practical effect to the words in the Royal speech: "To seek knowledge, more knowledge, and again more knowledge of the great heritage which has been entrusted to us is the soundest Imperial policy"—it is likewise the soundest individual policy. His Majesty hopes that the achievements of 1924 will be exceeded by those of 1925. We believe they will be; for when the stupendous work is presently done, those who have co-operated in it will "give a complete and vivid picture as before and yet a fresh picture," which "was a task calling for infinite resource and energy." The most belated work is the old quondam Palace of Engineering, now the Palace of Housing and Transport; and in the Palace of Industry there is still a good deal to be accomplished to give the final finish—particularly in the chemical section. But it is now simply a question of the unpacking of huge cases, and the arrangement of contents—everything is ready for their reception. Nevertheless there was more ready for inspection on the opening day than one could devote time to in a single visit. This year there will be more space available for the crowds in the buildings; and there will be more inducements for concentration upon the exhibits. Everything possible has been done to bring to bear upon this year's exhibition the experience gained in this remarkable Empire enterprise last year; and the exhibitors are going to benefit from what was learned in 1924.

It is altogether a lighter and brighter exhibition, and, in making it so, those responsible have given fresh opportunity to the gas industry. In his speech, His Majesty said that he noted with special pleasure that one of the great halls has been devoted to exhibits illustrating those problems of housing and transport which call so urgently for solution. It was a happy inspiration to make housing and house building a central feature of the exhibition, for the foundation of the Empire is the home. In the vast Palace of Housing and Transport on Saturday, the workers in brick and divers other structural materials, the painters, and the decorators were operating with might and main to bring to a finish what will be virtually a whole street of dwelling-houses, of different structural materials, of different design, and different equipment, and through the "B.C.G.A." and otherwise gas will be there, demonstrating the all-gas house, and the valuable contributor that it is to the liberty and leisure of the occupants. The adequacy of space will give more accommodation for inspection than one had of the temporary houses at another recent exhibition. Adjoining is the grand centenary display of the railway companies; and this is remarkably attractive to people. The fine modern locomotives, the saloon carriages, the demonstrations of signalling and control, all testify in themselves, and by comparison with locomotives of an early generation, to scientific and technical progress. In the same building there are the examples of the aeroplanes which are used by the "R.A.F.;" and there are motor-cars. Thus rail, road, and air transport are seen. It is an advantage for one exhibit to be in close touch with another which also draws people to Wembley and invites their interest, as will the railway centenary exhibits, the aeroplanes, motor-cars, and houses in this case. Having long since passed its centenary in public service, the gas industry can heartily congratulate the railway world upon the completion of its hundred years of service. As we pass out of the Palace of Housing and Transport, we notice standing derelict the building in which the domestic uses of electricity were demonstrated last year, and the electrical rendezvous now being devoted to an altogether different purpose.

In the Palace of Industry there is interest in abundance for the public; and centralized in its old buildings, redecorated, is the Gas Exhibit with extended accommodation and preparations nearing completion and perfection for a variety of demonstrations more far-reaching and spacious than the superficies admitted of last year. It would, we are satisfied, have been the height of folly for the industry not to have participated in the display this year. Great as were the opportunities last year, they will be greater this; and of them those in charge of our interests there are taking full advantage through the enlarged diversity of exhibits, an attractive presentment, and a programme in which is embodied the experience and knowledge gained during the six months' display in 1924. We have this year an Overseas Demonstration Hall, a General Exhibits Hall, a Lecture and Demonstration Hall, and Rest Lounge. The universality of gas use is to be seen by the examples of application from Canada, Australia, South Africa, India, and New Zealand; and a Pioneer's Store will serve to illustrate how the products

of coal carbonization contribute to the service of the industrial activities of our kith and kin across the wide seas. Science knows no bounds, nor does the gas industry; and technical and commercial interests are common wherever there is gas supply—the only exception being the ordinances which govern and control the operations of the industries in the various countries. Empire foodstuffs, and how they are cooked, will also engage attention. The idea of making the universality of gas one of the features of the Exhibit is in keeping with the Empire characteristics of the whole Exhibition. But this is only one of several features; and a wide range of domestic and industrial applications of gas will in a day or two be under demonstration. There will also be during the next six months strong emphasis laid upon the part the gas industry is taking in the national problem of smoke abatement; and the utilization of coke, tar, benzole, and its other products will be stressed. This is highly important in these days, when conditions have brought about a reduced demand. Enlarged requirements will come naturally from the revival of industry; but output is constantly on the increase not only from the gas industry, but from other sources. Educational work regarding the uses and merits of the secondary products must be on an intensified scale. Hence the greater attention that is being given to them in this year's display; hence, too, the road tar exhibit that the National Gas Council are making in the Chemical Section. All tar producers should support the Council in this matter, concerning which investigation and the compilation of the benefits realized as the result of practical experience are required. A serious campaign is necessary. The Exhibition this year gives the opportunity for a start in this. The importance of life in the Exhibit as an attraction has been fully realized, and is being materialized. There will be living tableaux, moving machinery, a daylight cinema, and lectures and cookery demonstrations. The spacious additional hall which has been secured, leading direct from the former halls, enables so much more to be done than last year.

As an educational centre for the gas industry, the Exhibit will be all that the 1924 display was, and much more; and every care is being taken to get not only the general public but people of influence in advisory and other capacities to come and see for themselves. The money provided by the gas-supply undertakings and by the manufacturers of plant and gas-using appliances is being well spent. Already excellent advertising has commenced, which will lead to the Palace of Industry, and to one of its central features—the Gas Exhibit. The descriptive article on later pages will supply readers with the details. Of this we are confident—when the finishing touches have been applied to the Exhibit, and the programme is in full swing, there will be general and cordial approval from the whole industry.

Apart from the Exhibit, a descriptive article is included in this issue which shows how extensively gas is being used in the processes of other exhibitors. We count this not an unimportant thing, as successful application by one manufacturer is an example, with the realization of efficiency and an overall economy, which other manufacturers in the same line of business will be induced to follow. Another special and illustrated article which will give gratification is that dealing with the catering arrangements for the multitude who will be visiting the Exhibition. Several well-known caterers are participating in the work this year; and with one accord they have adopted gas as their principal heating agent. We need not dwell upon this, because the act of adoption speaks louder than words, and the testimony is that of experts, to whom efficiency, economy, flexibility, and reliability are all-important.

Well satisfied as we were with the achievements of last year's gas display, we are hoping for more from this and from the attendant work. That result is being sought by those who are doing the main work in organization; and we heartily wish them a magnificent success. The assurance of this will be strengthened by every local effort throughout the industry to advertise the Exhibit, and to arrange for local influential men to visit it. The Exhibit belongs to the gas industry. Therefore, our counsel to gas undertakings is—Make good use of it.

Municipal Prohibition of Gas.

Many municipal authorities are the owners of electricity supply undertakings in competition with gas undertakings carried on, under statutory authority, by private enterprise. A gas undertaking administered by a company is a public service equally with a municipal electricity undertaking, and is usually a larger ratepayer than the latter. A municipal authority have no legal or moral right to interfere with the trading freedom of the gas company, and they have certainly no right to restrict the liberty of ratepayers to exercise their own will as to which concern they shall patronize for light, heat, and power. The Legislature has imposed upon gas undertakings the obligation to supply, under specified conditions, any occupier of premises with gas upon demand. That confers upon individuals a right which municipal authorities must be restrained from over-riding through their ownership of electricity undertakings. The possession of electricity trading powers by local authorities was never intended by Parliament to enable them to impose conditions upon any individual which would abrogate his rights under the General Law. The Newport (Mon.) Corporation thought the contrary. They have now been told, in effect, that they have no right to do anything of the kind—in other words, that they are not entitled to prescribe conditions which confer a preference upon their electricity undertaking, and which will interfere with the statutory authority and obligations of another trading concern in the area of their jurisdiction. The gas industry is the debtor of the Newport (Mon.) Gas Company for having set this matter right, and for having established a precedent in a measure promoted by the Corporation which can, for all time, be used should any other municipal authority seek to do what the Newport Corporation attempted.

What has occurred is an enlargement of something that had its inception in 1921, when the Corporation developed their housing scheme on the Somerton Estate. In the letting agreement which every tenant was obliged to sign, the Corporation inserted this condition: "The tenant hereby agrees as follows. . . . Not to use gas for the purpose of lighting the premises." There the tenants were deprived of exercising their own will of patronizing the form of light they preferred. In the present session of Parliament, the Corporation in their Bill sought power to develop any lands belonging to them, to erect houses, shops, offices, warehouses, and other like buildings, and to sell, lease, exchange, or otherwise dispose of such premises "upon and subject to such terms, conditions, and restrictions as they may think fit." Sub-section 2 of the clause gives power to the Corporation to grant leases of lands; and sub-section 3 provides that "the Corporation, in selling or disposing of such lands, may attach to the same, and may convey the same, subject to any conditions and restrictions upon the use thereof, and as to the buildings to be erected thereon, and as to the use to which such buildings may be put." We are not surprised that, in view of the condition imposed upon the tenants on the Somerton Estate as to not using gas for lighting, the Directors of the Gas Company and their Engineer and Manager (Mr. J. Herbert Canning) were apprehensive that the powers asked for in the Bill would constitute a statutory confirmation of the action of the Corporation, might be used to the prejudice of the Company and their present or prospective consumers, and might deprive the latter of their freedom of patronage, and abrogate the statutory obligations of the Company to the extent of a similar condition (as to the use of gas) imposed in respect of all lands and premises which the Corporation sold, leased, exchanged, or otherwise disposed of. It is significant that the Corporation refused to give the Gas Company any protection or assurance in relation to the clause; and therefore the latter had no option but to petition against the Bill. What, however, the Corporation declined to do, a Committee of the House of Commons did on Tuesday of last week. They saw the righteousness of the Gas Company's claim; and perhaps they also saw that the Corporation were endeavouring to take an undue advantage of their position to obtain preferential rights which could be used to the detriment of their trading competitor, by depriving of freedom of patronage of one of the

agents for light, heat, and power the occupiers of such premises and lands as were covered by the (in its unqualified form) objectionable clause.

The upshot was that the Committee accepted the protecting clause for which the Company had originally asked. It now stands as sub-section 4 of the Bill, and reads :

(4) The Corporation shall not make or impose under the powers of this section, any term, condition, or restriction with respect to the form of light, heat, power, or energy to be used in any house, shop, office, warehouse, or other building, or on any lands, or with respect to the taking from any particular local authority, company, body, or person of any form of light, heat, power, or energy.

That is a just clause. It protects not only the Newport Gas Company, but the purchasing liberty of the occupiers of all premises with which the Corporation have anything to do. Not only that—the clause is framed in a catholic spirit, and secures unfettered trading in the community for the suppliers of any form of light, heat, power, or energy. It is a valuable precedent. It would have been particularly harmful to the gas industry had the Corporation secured the powers originally sought by them without qualification, for that would have given a precedent of which other municipal authorities trading in competition with gas companies might have availed themselves. We congratulate the Newport Gas Company upon their action, the resistance to which by the Corporation shows that the former did not, in our opinion, misinterpret the intentions of the latter.

An Ugly Shock for 43, Cannon Street.

An ugly shock has been administered to the company promoters who have made their nest at 43, Cannon Street; and we hope, now that a Government Department has got into close touch with Colonel Eaton and his associates or puppets, something will be done to make such effective public exposure that their activities will be much curtailed or, better still, altogether suppressed. People who consider that they are clever at the form of company promotion that has been carried on with such fervour from the address mentioned, sometimes make a false move which is a considerable disadvantage to them, and an advantage in revelation to other people, including their victims. What has happened is that the Barford Electric Supply Company, the shares in which were bought by the Eaton group and the associated concern the "Warwickshire and South Midland Electricity Supply Corporation, Ltd.," applied to the Electricity Commissioners for an Order, with the view possibly, if obtained, of utilizing it as a lever for extracting further money for this "enterprise" from the pockets of the easily misled section of the public on whom this type of promoter lives. The Leamington and Warwick Electric Company also applied for an Order; and this led to an inquiry being arranged by the Ministry of Transport, which was conducted by Colonel C. T. Ekin, assisted by Mr. W. Cooke. When the inquiry was held at Leamington, the Inspector soon found that there was no more intention on the part of these Cannon Street gentry of letting him peep further behind their financial scenes than they are accustomed to do in divulging to the public, when inviting subscriptions for capital, the exact financial position of, and actual business done by, the puny concerns which are their nuclei, and to which mostly big territorial names are given, and, to obtain proper symmetry and for other reasons, capital to match is sought. The Leamington and Warwick Electric Company ought to be thanked, by all who desire honest company promotion, for the part they, through their Counsel, Mr. Craig Henderson, K.C., took in bringing about the revelations in this case—revelations drawn from the reluctant mouth of Mr. C. A. Turner, who acts as auditor and accountant for several of the Eaton promotions, and whose admissions suggest that he works dutifully to instructions.

The inquiry occupied two days; and it was on the first day that Mr. Turner made what are described by one report as his "startling admissions," and felt somewhat the worse for wear after he had undergone a searching cross-examination by Mr. Craig Henderson, and pertinent questioning by the Inspector, who was evidently not altogether in the dark as to the character of promotion with which he had to deal. Among other points, the much prospectus-advertised Turner had to confess that Eaton had been attacked very severely in practically all the financial papers (others could be mentioned) with regard to undertakings which he had launched on the public; and attention was called to an uncomplimentary epithet that had been applied by "Truth" to Eaton, while witness had been described as his "tame auditor." Mr. Turner admitted that no notice had been taken of these hurtful epithets. Probably the high sense of delicacy that resides at 43, Cannon Street has prevented any action being taken, or maybe these men consider that their position in public estimation enables them to treat their critics with contempt. But the fact remains that the criticism that has been directed against their schemes from all sides has not tempted them to enter the Courts to prove the purity and soundness of their schemes and their philanthropic motives in offering the public "investments" carrying the promise on paper of high interest or remarkable dividends. On the second day of the inquiry, Colonel Eaton and Mr. Turner—probably discreetly—did not put in an appearance. We are not surprised. For Eaton to have to sit and hear during one day things such as were said about his guileless promotions must have lacerated his very soul; and Mr. Turner, we should imagine, had no particular wish to be at hand on the second day for further interrogation, should the Inspector or Mr. Craig Henderson have discovered during the adjournment fresh information they desired to elicit—especially in view of the fact that the Inspector had announced his intention of visiting the hydro-electric generating station before resuming the inquiry on the second day. Mr. Turner called it the "factory;" and Counsel stated that it was otherwise known in the district as "the old mill!"

It appears from the evidence that, before the Cannon Street group got the Barford concern into their hands, the capital consisted of 1200 ordinary shares of £1 each and 2200 preference shares of 10s. each. But Mr. Turner says the fully subscribed capital of the Company is now £23,024! Mr. Craig Henderson put this question: "So this little concern at Barford, valued at £3000, is made responsible for £10,000 loan capital, £15,000 share capital, the associated working Company has got 12,000 preference shares, nearly 12,000 debentures, and altogether £23,000 odd of subscribed capital?" Mr. Turner replied "Yes." The money was sought and obtained before the Order was applied for! A later question by Counsel divulged the fact that 62 women and 52 men were on the shareholders' list—the women having subscribed £6813, and the men £3344. "Don't you think that is pathetic?" asked Mr. Craig Henderson. And the estimable Mr. Turner replied: "I don't see that at all." That these people distribute their precious documents in no half-hearted way is seen from the fact admitted by witness that £383 had been spent on postages in circulating this Company's prospectus. That sum is equal to 91,920 pennies; thus Counsel was justified in putting the copies distributed at 90,000. Another interesting point is that in the preparation of the wonderful reports bearing the name of Mr. Turner, which appear in the prospectuses sent from 43, Cannon Street, or the provincial offices from which operations are sometimes conducted, that gentleman works to "instructions." Figures are placed before him; and from them he prepares percentages. Any schoolboy could do that. He had no books or figures available at the inquiry which were required either by the Inspector or Mr. Craig Henderson; and he acknowledged that the big percentage increases in revenue and business were simply prepared by him on the figures that the promoters gave him. And when people see these high percentages and the promise of big returns on their money, they must expect a risk—according to Mr. Turner. Of course, this depends upon who the people are. The prospectuses of these promoters, in the work of whom Mr. Turner professionally participates, reach all sorts and conditions of intelligences.

All through it was a sorry spectacle; but excellent service has been done to the public in getting so far

behind the scenes as to see how these things are worked. Another question put to the same witness was: "Has Eaton not 'rung the changes' from one company to another?" The reply was: "That is no business of mine, is it?" This gave Counsel the opportunity to say: "If you put 'is it' to me, I tell you I should make it my business to see it did not continue." To which Mr. Turner replied: "I did not say I should not take action in the matter; but I have not done so up to the present." Why not? Small wonder that the Inspector said he was very dissatisfied with the evidence of the witness—particularly in view of the fact that a letter was sent to the Company on April 6, stating that it would be necessary for the respective promoters to furnish the fullest technical and financial information; and yet regarding 50 p.ct. of the questions put to witness, he knew nothing. The local evidence was firmly against powers being granted to the Barford Company and its associate the "Warwickshire and South Midland Electricity Supply Corporation, Ltd.," for both of whom (if they are really divisible) Mr. Wilfrid Burton appeared. He seemed somewhat surprised at the course the proceedings had taken; and, before the inquiry closed, he took the opportunity of saying to the Inspector: "The evidence I have put before you is not of the nature I am used to dealing with." To this Colonel Ekin replied: "I hope for your sake it is not." It is a singular coincidence that one of the Directors of the Warwickshire and South Midland Electricity Supply Corporation, Ltd., and the Wareham Electric Supply Company is Wilfred (not Wilfrid) Burton; and Wilfred Burton—a Solicitor's Managing Clerk—subscribed for 100 founders' shares in the Electric Light and Power Contracts Finance Corporation, Ltd.—the three Companies progeny of the 43, Cannon Street clique. What we sincerely hope is that the disclosures on this occasion will have an effect on the operations of this promoting group which will be beneficial to the public. The best effect would be the final business extinction of these people, who obtain money from unsuspecting folk by the mean artifice of extravagance, and that vividly coloured.

Income-Tax Allowances for Wear and Tear.

It may be inferred from the useful little paper, read by Mr. W. M. Galleway, of Whitby, before the members of the North of England Gas Managers' Association last Friday week, that gas companies are still in existence who are not economizing, in one respect, in their outgoings to the extent that they might do. The contribution deals with a subject which has perennial interest for the secretaries and managers of gas undertakings—that is, income-tax allowances for wear and tear of gas-works plant, including meters (ordinary and prepayment), gas stoves, fires, &c. In effect, the paper shows the advantages there are to small or medium-sized gas companies in adopting the scheme for determining income-tax allowances for wear and tear and maintenance which resulted from the discussions and the work of a Committee representing statutory gas companies in negotiating, in 1912, with the Inland Revenue Authorities. The whole question at that time was a highly controversial one, and caused no end of vexation and worry to those who had year after year to treat of these matters. It was therefore a happy termination to the work undertaken, with masterly skill and diplomacy, by the Committee referred to, when a definite agreement was reached. Nearly everybody concerned was heartily glad, though a few critics still remained who thought that gas companies had not got all they should have. Perhaps they did not; but the fact was that they had obtained a settlement with the authorities which has proved invaluable. Of course, acceptance of the agreement was not compulsory. It could be adopted at will by gas companies all over the country; and to those who did not subscribe to it, appeal was open precisely as before. In view, however, of the fact that statutory gas companies representing a large proportion of the capital of private gas enterprise endorsed it, made it practically universal in its application. In the paper by Mr. Galleway the agreement is set out in the form in which it was published in 1912.

Three years later the scheme was adopted by the Whitby Gas Company; and although there was a little hesitation on the part of the surveyor of taxes in accepting the claim of the Company as originally presented to him, an inspection by him of the Company's books resulted in his admission of the correctness of the claim. The scheme was put into operation and worked until 1921, without any exception being taken by the Revenue Authorities, notwithstanding the fact that the allowance for wear and tear exceeded the amount of tax deducted for the interest and dividends paid annually to stock and share holders. About that time, however, a new inspector of taxes was appointed; and he refused to allow depreciation at the rates to which the Company were entitled, and which they had been allowed from the period of the adoption of the scheme. What the new inspector contended was that the Directors were compelled by the Customs and Inland Revenue Act, 1888, section 24, sub-section (3), to pay over to the Commissioners of Inland Revenue the full amount of the tax deducted from dividends and interest paid to the debenture stockholders and shareholders from year to year, irrespective of any claim which the Directors had for depreciation. His intention therefore was only to allow a sum equal to the amount written off annually for depreciation as shown in the statements of accounts. The result of this objection on the part of the new inspector is interesting, in view of the further confirmation it gave to the agreement. Naturally the Directors maintained they were entitled to the full allowance of 3 p.ct. on gasholders and 10 p.ct. on meters, gas stoves, &c., as provided for in the scheme, and that there was no reasonable ground for raising an objection to what had become an established precedent. Expert advice and Counsel's opinion were obtained, and both confirmed the Directors' contention. The upshot was that the inspector's objection was withdrawn. The scheme is therefore still in operation, and to the advantage of the undertaking, though it is an advantage which is only just.

Those gas companies who have not adopted the scheme should consider Statement B in the paper. This gives some idea of the benefits which have, since the scheme was put into operation, accrued to the Whitby Company and their customers. Looking at the figures, one can appreciate Mr. Galleway's opinion that those undertakings which are not under the scheme would do well to give serious consideration to whether it is not to their interest to claim the allowances which are granted by it. As a matter of fact, we cannot understand any statutory undertaking entitled to come under the agreement rejecting the certain allowances obtainable under it, unless they are enjoying fair treatment otherwise, and so are loath to disturb the existing arrangements.

A Big Coke Contract.

It has been known for a long time that at the Greenwich power station which supplies energy to the London tramways, gas coke is used with coal for boiler firing; and in the past, some good figures have been made public as to a considerable resulting economy. Among the contracts settled last week by the London County Council was one with the South Metropolitan Gas Company for 45,000 tons of coke for the Greenwich station. Knowledge of the large use to be made of coke at this important station may serve the good end of stimulating a greater interest among electrical engineers in the advantages for steam-raising of utilizing coke in company with the cheaper varieties of small coal and slack on (say) the "Sandwich" system. The coke position to-day urges that no effort should be spared to cultivate all the demand possible in every direction.

Special Orders and the One-Half Proportion.

Perhaps we did not in the note published last week make it altogether clear that one object of the Aldershot Gas, Water, and District Lighting Company in the Special Order for which they are applying to the Board of Trade is to continue, in their case, the temporary provision of the Public Utility Companies (Capital Issues) Act as to the one-half proportion of borrowing powers to paid-up capital. The Act will expire on the 20th inst. Mr. A. S. Campbell, of Wellingborough, points out the position in our "Correspondence" columns. He says: "The novelty of the Aldershot application lies in the fact that it is the first application for such temporary powers under the Act

to be made permanent "—that is, the extension of the borrowing powers to one-half the amount of the issued and paid-up share capital. As a matter of fact, it cannot be described as a novelty or a precedent. The one-half borrowing proportion is now a common clause in Special Orders, as it had been previously for many years in Gas Acts. Moreover, the Aldershot Company cannot, we find, claim novelty for continuing by Special Order the provision of the Public Utility Companies (Capital Issues) Act. In 1921, the Romford Gas and Coke Company, Ltd., obtained a "Capital Issues" Consent from the Board of Trade; and the Secretary of the Company (Mr. G. Berridge) calls our attention to the clause which they secured in their Special Order of 1922, and which perpetuated the one-half proportion of borrowing powers. The clause reads: "11.—(1) Section 14 (Limit of Borrowing Powers) of the Order of 1904 is hereby repealed. (2) The amount of all moneys borrowed by the Company, and secured by mortgage of the undertaking, shall not at any time exceed in the whole one-half of the amount of the capital of the Company for the purposes of the undertaking actually raised by the issue of shares or stock, including any premium obtained on the sale of such shares or stock."

Small Unit Nitrogen Fixation Plants.

Dr. Luigi Casale, the inventor of the Italian process for the fixation of atmospheric nitrogen, has been entertained to dinner in London by a number of scientists. On the occasion, the Technical Director of the United Alkali Company (Dr. G. C. Clayton, M.P.) made an important statement as to developments of nitrogen fixation in this country. He said that after the great war it was felt that the country must have an independent source of synthetic ammonia. A Haber plant is working satisfactorily at Billingham; but Dr. Clayton points out that this is only one plant, and might be a source of great danger in the case of air raids. In addition, the Haber plant, in order to realize the maximum success, must be installed on a large scale. This, according to Dr. Clayton, is where the Casale plant comes in. It can be made in smaller units and distributed throughout the country, and this segregation would greatly minimize risks from air raids. In this matter, Dr. Clayton is evidently a strong believer in "security first."

PERSONAL.

Mr. A. Cook, Assistant Engineer and Manager to the Warrington Corporation Gas Department, has been appointed Engineer and Manager to succeed Mr. W. S. Haddock, who retires on June 30.

Spontaneous Combustion of Coal.

Discussing, in "Industrial and Engineering Chemistry," the question of the deterioration and spontaneous combustion of coal in storage, Mr. S. W. Parr, of the University of Illinois, says it is difficult to summarize the information which he presents in terms of possible rating as to storage adaptability of specific coals. The fundamental factors involved, however, would seem to suggest the propriety of assigning storage qualities on the basis of size rather than type. For example, the high-moisture coals of the lignitic type would be set down as the most difficult, or impossible, to store without heating. The next in order of betterment would be the bituminous coals having from 12 to 15 p.ct. of moisture. The paramount factor in all bituminous coals, however, is fineness of division. This would include, of course, tendency to breakage, and the production of fines in the process of shipping and handling. Those coals which disintegrate least on weathering are less ready to start active chemical reactions in the pile. Lump sizes free from duff may be safely stored. In coals of the low-volatile type there is a low-water content and a greatly reduced avidity for oxygen; but these qualities, which should contribute directly to the storing properties of these coals, are frequently offset by structural peculiarities that contribute to the ease with which they disintegrate and develop fine material. However, it should be noted that, because of the greatly reduced absorption capacity of such coal for oxygen, the fines do not have nearly the danger that attaches to fine material from the high-moisture coals. Although initial reactions resulting in the development of heat may have their origin in the carbonaceous substance, independent of the presence or absence of sulphur, still it must appear that this latter element constitutes an added feature requiring consideration. But since the danger from sulphur largely centres in the duff, an added argument appears for eliminating the fine material from the mass.

ELECTRICITY SUPPLY MEMORANDA.

Colliery Super-Stations and Consumers' Charges.

The idea of big super-stations in colliery districts has lost much favour in electrical circles. The recession from the worship of such stations has been a gradual one. First, the experts began to wonder where the water for condensing purposes was to be obtained in proximity to coal mines. Then it dawned upon them that huge transmission systems running through miles and miles of rural territory, with little demand there, would be costly, upkeep great, and losses of electrical energy painful to contemplate. When they came to balance up things, the conclusion was reached that what might be saved on generating fuel at the pit-head would be more than swallowed up by the transmission costs and losses. Now labour developments are considered to be a factor; and there are doubts as to the wisdom of placing stations where the miners can, to serve their own ends, bring influence to bear upon them. The combination of miners and the Electrical Trades Union would indeed constitute a potent alliance with the means of generation located at the collieries. It is easy enough to vision some most unhappy consequences of such concentration of generation—if practically feasible—with concentration of labour power. In times of war, too, the collieries and the generating stations at them would form fine objectives for an enterprising enemy. Large dimensioned generating stations so situated, we are inclined to think, would be stoutly resisted by the electricity industry. The whole object of such location is cheapening of electricity supply. One way of bringing this about, without all the bother of reconstruction, would be by making it illegal for municipal authorities to extract profit from their electrical undertakings (and the same should apply to their other productive concerns), and to bring electricity companies under the sliding-scale system of price and dividends. Speaking of charges, no one in the electricity industry seems disposed to come forward with a scheme for selling electrical energy on the therm basis, so that the two competing industries would be on an equality—so far as the basis goes. We are afraid electrical men do not take the idea seriously. If they did, no one would be more surprised than we should be. If any electrical man would argue the matter in favour of adoption, he could drag in the support of the vaunted efficiencies of electrical operation. See how they would help him!

Tariffs and Development.

In the "Memoranda" for April 22, notice was made of two papers, which had recently been read at a meeting of the Institution of Electrical Engineers, on the subject of scientific two-part tariffs. It will be remembered that one of these was jointly by Mr. George Wilkinson and Mr. R. M'Court. In the discussion, there was a considerable amount of criticism of the methods proposed by the authors, chiefly on account of the additional complexity which it was thought would be introduced, and which would be altogether beyond the understanding of consumers. Mr. Wilkinson has contributed an article to the "Electrical Times," with the intention of disposing of the criticism. In his opinion, the opposition is largely due to the fact that the uniform tariff advocated has been examined and criticized on the basis of present-day development and experience rather than on the conditions which will obtain when electricity is commonly used for all labour-saving purposes, both in the house and in the shop. For the sake of the gas industry, we hope (and there is some basis for it) that the conditions which Mr. Wilkinson has in view will not develop. In the existing two-rate tariffs, he finds defects and glaring inconsistencies. Most of us have done that—in fact, their presence has been observed from the very introduction of the systems. Mr. Wilkinson is enthusiastic He believes that a closer investigation of the subject will probably establish the view that the enormous additional business waiting to be picked up at the very doors of every supply undertaking, which dazzles the eye and excites the mind of the imaginative, will never be attained while the existing tariffs remain. Present-day tariffs have, after many years of hard work and able management, approximated to an average load factor of about 25 p.ct.; but our friend who is trying to devise means for putting our industry to death asks what about the next 25 p.ct., and the possible next. Then he takes the case of an undertaking disposing of a modest top load of 3000 kw.

> With good management and economical operation we assume it has attained to a load factor of 25 p.ct.; and, therefore, in round figures, is disposing of 6,500,000 Board of Trade units a year. The cost of this service will, with modern plant, be round about 0·4d. for fuel, oil, and stores per unit sold, *plus* all the fixed charges. But what will be the cost of the next 6,500,000 units representing an increase in the load factor from 25 to 50 p.ct.? There are no additional fixed charges, there are no additional losses in the boiler-house, transformer excitation, meter shunts, &c. Therefore, as the additional load is to be obtained by spreading the supply over double the number of hours per day, the coal figure of 0·4d. per unit sold will be reduced in respect of the extra units by 25 p.ct.—viz., to 0·3d. Add 10 p.ct. for profit;

and we have 6,500,000 more units available for the use of consumers at the attractive figure of ¾d. per unit, or 13,000,000 units at the same low price if the load factor can be raised to 75 p.ct.

It is held by Mr. Wilkinson that present-day tariffs and methods of selling and use will not bring "this wonderful and perfectly possible boon upon the country; but it is attainable." The first essential towards demand is, he says, a two-part tariff with its fixed charge based on the electrical requirements of the consumer, with a very low price, (say) 0·33d. per unit, for all additional units taken. This tariff, in his opinion, will at once enable the consumer to relieve, on sound financial lines, his household and shop of much drudgery. Mr. Wilkinson is looking far ahead. Every electrical engineer has to consider his present practical conditions, and operate with them for his guide. He cannot assume the conditions of the future, nor can he apply to his present-day circumstances the unformed happenings of a distant period. Development to the point to which Mr. Wilkinson is aiming must come (if ever) by the process of evolution. We quite agree with him that, if a two-part tariff is adopted, the fixed charge should be based on the electrical requirements of each consumer. That is the only rational basis.

How is it to be Attained?

Mr. Wilkinson asks how what he suggests is to be attained? How can the extra energy be disposed of among existing consumers and usefully employed by them? We quote *in extenso* the answer he gives:

1. By a uniform tariff (two-rate) as set forth, based upon the electrical requirements of the household.
2. By wiring the consumer's premises on two circuits, the first being the "indispensable" circuit upon which electric service must always be available, and the second, which may be termed the "dispensable" circuit, supplying the water heating, part of the cooking apparatus, and such labour-saving devices as can conveniently be used during the periods of lighter loads.
3. By a system of automatic heat storage supplied from the dispensable circuit, and arranged to absorb energy off the heavy load periods, and dispense the same automatically to maintain uniform temperature in the rooms—supplemented with a low-power radiator on the hearth in the case of sitting-rooms. Also to furnish the necessary heat for cooking operations requiring boiling water, low-pressure steam, and the like.
4. A consumer's load regulator which will automatically protect him from imposing a greater maximum load upon the supply than he is entitled to under the terms of his supply agreement.
5. A thoroughly organized department from which the cookers, heaters, and current using and controlling devices can be obtained on attractive hiring terms or hire-purchase.
6. The employment of one cheap and effective two-rate discriminating meter only on each consumer's premises.

We sincerely hope, on behalf of the gas industry, that the electrical industry will put the proposals of Mr. Wilkinson into speedy operation; for we are satisfied that one of the best ways in which the latter can serve the former is by doing its utmost to confuse the consumers it obtains for various domestic purposes, and to run up the electrical equipment of houses to a point which will have throughout a district a still more impressive advertising effect regarding installation costs.

Artificial Light Through the Window.

We have had no innovations in the application of domestic artificial lighting for some time past. The variations are between direct, semi-indirect, and wholly reflected lighting. Now a new idea is presented to us by the General Electric Company. During day time, the light of a room is derived solely from the window or windows. If that is correct for daytime, why should it not be so for night time? The Company contend that the disposition of lights overhead or on the walls in the conventional styles is wrong; and the home of the future will be illuminated from outside the window at night, the same as by day—the difference being that, when the sun is not functioning for this particular purpose, then artificial light supplied from outside the window will take its place, so that people in the room may fancy they are enjoying brilliant sunshine, although there is rather a deficiency of the natural variety in these times. What the Company appear to be doing under this system is to instal a group of lights outside the window, in an arrangement (it is said) something like a fern case; and by this means the effect will be produced of sunshine streaming into the room. "It will be," one report states, "synthetic sunshine; but it will be precisely the same in appearance as the real thing." We are a little sceptical of this new idea. The intensity of light differs as the square of the distance from the source. With artificial light streaming through a window, a room would be unequally illuminated—much more so than with in the room a centrally disposed source of illumination. Persons standing or sitting before the sources of the artificial sunlight would throw uncomfortable shadows. We can imagine that two or three people reading in a room under such conditions would all be compelled to sit with their backs to the light in order to see the print. That would not be pleasant, unless they were on unfriendly terms. The more we think about the idea, the less we like it; but perhaps an inspection of the system may change our views. Anyway, the electricians make a point of the hypothetical evils of having gas lights in a room. The unnatural sunshine proposition will annihilate the electrical objections to gas lighting. If the economical incandescent gas lights are situated in a case outside the window, and the light from them streams into the room, they will be equally as advantageous as electric lamps—perhaps more so, because of the purity of the light and the economy of supplying it, especially with preheated cluster burners. Of course, there is nothing new in the idea as applied to shop window lighting. The lighting of goods inside shop windows after daylight fails has often been carried out by externally applied lighting; it is only in domestic lighting that the system has not hitherto been adopted. We are reminded, too, of the lighting of the House of Commons through the glazed ceiling of the Chamber. But that is top lighting. It is not the same thing as a window in one of the walls of a room. However, fancy having to equip all the windows in a house with outside light sources, protected by something resembling a fern case. We hope to be defended from having the pleasant views from any of our windows obstructed in this way.

Registration of Contractors.

We have not for some time past referred to this matter. As will be remembered, the scheme was designed with the view of obtaining an authorized register of electrical installation contractors, in order to provide all concerned with a list of the firms of recognized repute in the industry. The Registration Board have recently held their annual meeting; and it is interesting to note how far they have progressed in their work. It appears that the applications for registration up to the date of the last meeting of the Board (March 14) total 728, of which 670 have been accepted. No less than 46 applications have been declined and withdrawn; and twelve additional ones are receiving consideration. These figures do not suggest that the register has secured the adherence of any large proportion of the whole number of really competent electrical contractors in the country. In London and the suburbs, without the large provincial cities and towns, there is a plurality of contractors, and from those quarters one would imagine that a very high percentage of the accepted 670 contractors could have been obtained. We do not wish in any way to belittle the effort that has been made; but if the register is to be really effective in weeding-out undesirable contractors from the wiring business, then very much more than this will have to be done. It is interesting also to notice that six municipalities—Manchester, Hull, Wolverhampton, Bristol, Preston, and Croydon—have taken official action in support of the register by issuing notifications to the effect that they will only consider tenders from registered contractors. Several engineers of other municipalities have expressed sympathy with and approval of the register, although official support cannot be given by them until instructions have been received from their respective authorities. The method which has been taken to make the use of the register effective is by circulating the information among consultants and architects. There has also been an amount of reliance on the efforts of the registered contractors themselves, who, when submitting tenders, draw special attention to the existence of the register, and the guarantee as to standing and quality of work which is connoted by admittance to the register. It is observed that the Executive Committee are proposing to collect as far as possible a complete list of all the electrical installation contractors in the country, with a view to keeping before those not yet registered the advantages of registration. With regard to publicity, last year two printed lists of names of the registered contractors were circulated to the registered firms, supply engineers, consultants, and architects. A third list is now in preparation; and it is hoped shortly to issue this to approximately 10,000 addresses. Builders, it is mentioned, are the next group to be dealt with. In the gas industry we should also find acceptable some scheme which made a serious attempt to eliminate shoddy work and inefficient appliances.

Scottish Junior Gas Association (Eastern District). A visit to the Leslie and Markinch Gas-Works has been arranged for next Saturday afternoon (the 16th inst.); and the annual outing will take place on June 6, at Anstruther.

How Gas Can Help the Cinema Industry.—Cinema proprietors are to-day seriously concerned at the high charges made for electricity for the lighting of the cinema arcs, and of the theatres themselves. They generally have to pay for current used at the lighting rates, which vary generally from about 4d. to 8d. a unit. It is not surprising to find, therefore, that many of them are now generating their own current on the premises. For this purpose they are installing dynamos driven by gas engines, and in most cases have found that they can, by this means, get all the current they require at an inclusive cost of from 1½d. to 2½d. per unit. Several cases are mentioned in the current issue (No. 134) of "A Thousand-and-One Uses for Gas" in which the bill for electricity has been reduced by one-half as the result of local generation.

British Empire Exhibition, 1925.

The Gas Industry's Exhibit.

A MESSAGE FROM THE CHAIRMAN OF THE GAS EXHIBIT GENERAL COMMITTEE,

Mr. D. MILNE WATSON, M.A., LL.B., D.L.

THE British Empire Gas Exhibit Committee have endeavoured to make the 1925 Exhibit surpass in interest and importance that of 1924, which, by common consent, was of the highest value to the industry at home and abroad.

The Committee acknowledge with gratitude the splendid financial support already accorded to them. Nearly £28,000 has been received from 394 Gas Undertakings, and £6000 (estimated) from the makers of plant and apparatus. They look with confidence to the remaining Gas Undertakings in the Empire to add their proportionate subscriptions to the fund, so that adequate publicity may be given to this co-operative enterprise—for in that lies no small part of its potential value.

It is further hoped that the Gas Undertakings throughout the country will do everything in their power locally to interest the public in the Exhibit, and persuade them to visit it when at Wembley; and that the weather will be kind!

Then we may anticipate that the success of last year will be surpassed, and a further impetus given to the advancement of the industry in the service of the Empire.

AIM OF THE GAS EXHIBIT.

By F. W. Goodenough, Chairman of the Executive Committee.

The Gas Exhibit at Wembley in 1925, though housed in the same main structure, and having the same object in view, is essentially different from that of 1924 in detail and in method, as a visit to Wembley—or a reading of the "Journal" description—will make clear. But it is the object that is important, rather than the details.

The object in view in both years has been to impress the public mind with the magnitude, scope, and progressive vitality of the gas industry; with its ever-increasing achievements and possibilities of service to the individual, the community, the nation, and the Empire.

To do that by an exhibit within an Exhibition of such multifarious interest and on such a vast scale as that at Wembley, is no easy task. Some measure of success was achieved last year. Given sufficient attendance of the public this year, it is hoped that a greater measure of success may, through the experience gained in 1924, be achieved in 1925—especially if every gas undertaking does its share in advertising the existence of the exhibit to the consumers in its district before they make their pilgrimage to Wembley; incidentally advertising effectively the "aliveness" of the gas industry to those consumers whether they visit Wembley or not, as will the general publicity campaign and the Press comments on the Gas Exhibit.

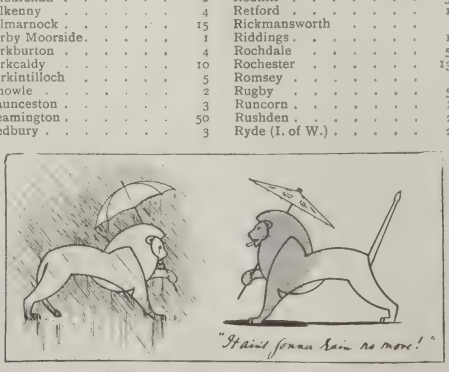
There are two things that the Gas Exhibit at Wembley is not, and could not in the nature of things be. It is not an exhibition of every gas fitting, gas appliance, and gas making and measuring apparatus on the market, for the interest and education of the gas manager and his staff—and at the same time the confusion of the man and woman in the street—such as gas exhibitions sometimes are; any more than a poster is, or can be, a catalogue. General impression, general effect, is all that one can hope to achieve with a particular exhibit within a vast and variegated exhibition. For the same reason, the Gas Exhibit at Wembley is not a showroom in which every consumer from every corner of the country can obtain the same detailed assistance in selecting fittings and appliances suitable for his own home or place of business as he should be able to obtain in the showroom of his local gas undertaking. Every effort will always be made to give individual visitors personal attention, accurate general information as to the advantages of gas, and detailed information as to the maker and list price of everything exhibited; but beyond this—unless the attendance of the public were so small that the Exhibition were a failure—it would obviously be impossible to go.

These are points that need to be borne in mind sometimes by gas experts criticizing a gas exhibit such as that at Wembley. "Gas is a great and growing industry; gas can be used with advantage by rich and poor alike; gas fittings and appliances can be made to harmonize with any style of furnishing and decoration, however simple or however luxurious. Gas is a great servant, domestic and industrial, not only of the Mother Nation, but of the world-wide British Empire; the gas industry has a great past but a still greater future; the gas industry was never more alive, alert, and advancing than it is to-day." These are the broad, all-important, all-impressive facts with which the Gas Exhibit aims to inform the public thought, and fire the public imagination in 1925, as in 1924. The complete catalogue, the detailed showroom, the itemed quotation, the actual order—these are the business of the local undertaking to provide and to secure. The Exhibit is an advertisement—almost in the nature of a poster—to attract, to interest, to create desire in the passer-by. If it attempted to be or to do more, it would fail because of over-detail, narrowness, confusion.

This year the broad note of this advertisement of gas is its world-wide utility and popularity; the fact that the most virile children of the Motherland use gas in ever-increasing degree; that it is, like the British race itself, ever renewing its youth, not passing into old age and decrepitude; that it occupies a great and growing place in the economics of the Empire. Was there ever a year in which such a note in publicity was more timely than in 1925? Is there any gas undertaking in the British Empire that will not readily subscribe to the cost of such an effort for the benefit of all?

SUPPLEMENTARY LIST OF SUBSCRIPTIONS PROMISED TO THE GAS EXHIBIT.

	£
Aberdeen	50
Abergavenny	5
Aberkenfig	6
Abingdon	5
Accrington	50
Adlington	3
Airdrie	10
Alcester	2
Aldershot	105
Alloa	25
Alnwick	3
Andover	10
Annan	2
Arbroath	10
Arlesey	1
Arundel	3
Ascot	11
Ashton-under-Lyne	25
Alexandria	15
Atherstone	5
Aylesbury	5
Aylsham	1
Bagnalstown	1
Barnoldswick	12
Barnsley	39
Barnstaple	10
Barrhead	10
Basingstoke	12
Bath	200
Batley	20
Bedford	40
Belfast	250
Berkhamsted	5
Bewdley	2
Bexhill	15
Biggleswade	3
Bingham	1
Birmingham	1,000
Bishop's Stortford	15
Blackburn	145
Blandford	3
Blyth	25
Bognor	10
Bolton	100
Boston	10
Bournemouth	250
Bradford	325
Bradford-on-Avon	4
Brecon	5
Brentwood	15
Bridgend	3
Bridgwater	15
Bridlington	31
Bridport	7
Brighouse	20
Brighton	63
Bristol	500
British Gas Light Co. (Hull, Norwich, &c.)	500
Brixham	5
Broadstairs	13
Bromsgrove	10
Brynmawr and Blaina	5
Burntisland	3
Bury St. Edmunds	10
Caerphilly	25
Cahir	1
Callender	1
Calverley	18
Camborne	5
Cambridge	105
Canterbury	12
Cardiff	250
Carlisle	60
Carlske	2
Carmarthen	3
Carnarvon	1
Carnoustie	6
Carrick-on-Suir	1
Castlecary	2
Cefn Mawr	2
Chapel Whaley	5
Cheltenham	75
Chertsey	10
Chesham	9
Chester	60
Chesterfield	60
Chichester	10
Chippenham	7
Chorley	25
Cinderford	3
Cirencester	10
Clacton	15
Clevedon	10
Cockermouth	3
Colne	36
Colville	6
Congleton	10
Corbridge	3
Cork	25
Corsham	1
Cradley Heath	30
Cranleigh	3
Crediton	3
Crewkerne	5
Cromer	5
Crossgates	5
Crowborough	5
Darlington	90
Dartmouth	5
Dawlish	3
Deal	21
Debenham	1
Desborough	5
Devon Gas Association	5
Doncaster	25
Dorking	10
Dover	25
Dudley	25
Dumbarton	15
Dundee	50
Dunfermline	25
Dunstable	5
Durham	12
Eastbourne	52
East Grinstead	10
East Hull	52
Eckington	5
Edinburgh	262
Elland	23
Elsecar	3
Exeter	100
Exmouth	16
Falkirk	25
Falmouth	8
Farnworth	10
Faversham	12
Felixstowe	5
Fenny Stratford	5
Fermoy	1
Folkestone	25
Formby	5
Frodsham	5
Galway	2
Gillingham	2
Glasgow	1,410
Gloucester	85
Godalming	9
Goole	5
Gravesend	20
Grays and Tilbury	40
Great Torrington	1
Great Yarmouth	26
Greenock	50
Guernsey	10
Guildford	25
Guisborough	2
Halifax	105
Hamilton	12
Hampton Court	57
Harpenden	16
Hartwich	5
Haslemere	5
Hastings	75
Hathersage	5
Hawick	3
Hayfield	2
Hemel Hempsted	15
Hemsworth	3
Hereford	10
Herne Bay	15
Hertford	11
Hessle	10
Hexham	10
Heywood	10
Highbridge	2
Hitchin	10
Holbeach	1
Horsham	10
Hungerford	1
Ilfracombe	25
Ilminster	5
Imperial Continental Gas Association	10
Ipswich	125
Irthlingborough	6
Jersey	10
Kelvedon	2
Keswick	5
Kettering	39
Kidderminster	10
Kilbarchan	2
Kilkenny	4
Kilmarnock	15
Kirby Moorside	1
Kirkburton	4
Kirkcaidy	10
Kirkintilloch	5
Knowle	2
Launceston	3
Leamington	50
Ledbury	3
Leeds	500
Leicester	400
Leiston	2
Lennoxtown	2
Lewes	5
Leyland	13
Lichfield	10
Lincoln	50
Lismore	1
Littlehampton	10
Liverpool	995
Llandrindod Wells	2
London District—	
Brentford	1,000
Commercial	500
Croydon	500
Gas Light and Coke Co.	5,500
Hornsey	50
Lea Bridge	35
North Middlesex	26
South Metropolitan	2,475
South Suburban	525
Tottenham	500
Wandsworth	500
Long Eaton	50
Longford	1
Lostwithiel	1
Lowestoft	17
Luton	90
Lutterworth	2
Lytham	25
Magherafelt	1
Maidstone	61
Malton	11
Margate	35
Market Weighton	1
Marsden	5
Matlock	10
Melksham	5
Merthyr Tydfil	25
Middlesbrough	100
Monifieth	3
Monmouth	3
Mountmellick	1
Narborough	5
Nelson	25
Newbiggin-by-Sea	1
Newcastle	500
Newmarket	8
Newport (I. of W.)	12
Newport (Mon.)	75
Newport Pagnell	1
Normanton	12
Northampton	100
Northfleet	2
North Walsham	1
Oakham	2
Oriental	10
Ormskirk	10
Oswestry	5
Oxford	75
Oundle	2
Padstow	1
Pembroke	10
Penicuik	2
Penrith	9
Penzance	7
Peterborough	25
Petersfield	5
Pinner	10
Plymouth	250
Portadown	5
Portsmouth	356
Prescot	5
Preston	145
Pudsey	20
Quaker's Yard	3
Radcliffe	20
Ramsgate	25
Rathfriland	1
Reading	150
Redhill	50
Retford	16
Rickmansworth	5
Riddings	15
Rochdale	50
Rochester	130
Romsey	5
Rugby	52
Runcorn	16
Rushden	25
Ryde (I. of W.)	25
St. Albans	34
St. Austell	5
St. Blazey	2
St. Helens	50
St. Ives (Hunts)	2
St. Just	1
St. Neots	3
Salisbury	26
Sandown	3
Scottish Junior Gas Association (Western District)	5
Seaham Harbour	13
Sedgley	10
Shaftesbury	1
Shanklin	7
Sheerness	15
Sheffield	650
Sherborne	5
Sheringham	5
Shotley Bridge	25
Shrewsbury	40
Silloth	1
Silsden	4
Sleaford	6
Slough	15
Smethwick	100
Snodland	9
Soham	1
Solihull	7
Southampton	175
Southend-on-Sea	50
South Emsall	5
South Normanton	5
South Shields	50
Spenborough	44
Spennymoor	12
Stafford	25
Stanley	10
Stalybridge	20
Stourbridge	35
Stourport	3
Stranraer	3
Stratford-on-Avon	10
Stroud	28
Sunderland	250
Sutton	50
Swadlincote	3
Swindon	25
Swinton	5
Tamworth	5
Taunton	27
Tavistock	4
Tewkesbury	2
Thirsk	3
Thurles	1
Tichfield	1
Tipperary	2
Tonbridge	30
Torquay	50
Totnes	3
Truro	8
Tunbridge Wells	65
Uxbridge	50
Ventnor	7
Wadhurst	1
Waltham Cross	10
Walton-on-Thames	20
Warminster	3
Warrenpoint	1
Warwick	15
Waterford	8
Watford	50
Wath	20
Wellingborough	50
Wellington (Salop)	20
Wellington (Som.)	5
Wells (Som.)	6
West Bromwich	70
Westbury	2
Westerham	1
Westgate	11
West Hartlepool	75
Westward Ho!	1
Weston-super-Mare	30
Weymouth	25
Whetstone	5
Whitby	5
Whitchurch (Salop)	5
Whitchurch (Hants)	2
Whitehaven	5
Wicklow	1
Wigan	50
Wimborne	3
Winchester	25
Windermere	2
Windsor	13
Wisbech	10
Wivelscombe	1
Wolstanton	10
Wolverhampton	161
Woolton	3
Worcester	75
Worksop	10
Worsborough Dale	3
York	115
Society of British Gas Industries (estimated)	6,000
	£33,730



1924. 1925.

THE NEW WEMBLEY.

OPENING BY THE KING.

On Saturday last the 1925 Season of the British Empire Exhibition was declared open by H.M. the King. The British Nation have a gift for ceremonial pageantry ; and the pomp and circumstance of the opening ceremony, which was witnessed by over sixty thousand people, once more reminded us of our magnificent tradition, and of the importance and high endeavour of the Exhibition. The spectacular and musical splendour of the ceremony, and the unbounded enthusiasm of those who witnessed it, were fitting tributes to the efforts of all who have aided at making the Exhibition of even greater appeal than it was last year.

Last season Wembley challenged one of the worst summers on record; and though before noon on Saturday the sun shone brightly, it was a strange coincidence that, just as the Exhibition was declared open, there should be a shower of rain. It was, however, only a shower; and for the rest of the day the weather was delightful. Hope was that the last adverse effort of the weather god had been made, and that he had decided, after showing his strength, not to interfere with the success of the 1925 season of the Exhibition. On the opening day last year 63,000 people entered the Exhibition; this figure was nearly doubled last Saturday.

In asking the King to declare the Exhibition open, the Duke of York, who is the President this year, said that the date had been chosen as being the fifteenth anniversary of the coronation of the King. "The benefits which flowed to the Empire from the holding of the Exhibition in 1924," continued His Royal Highness, "were so marked that it was decided to continue it for another year. The 1925 Exhibition has integrally the same purpose as in 1924—to show how great are the resources available within the Empire; but while the Exhibition thus maintains the same character, it will present its lesson of Empire in a new manner. . . . The aim has been to provide not only a complete university of Empire, but a great pleasure and recreation ground."

Points from the King's Speech.

The King, in reply, said: "The British Empire depends for its security and prosperity on goodwill between its constituent peoples; and the one sure foundation for that goodwill is a full knowledge of our mutual aspirations, capacities, and needs. To seek knowledge, more knowledge, and again more knowledge of the great heritage which has been entrusted to us, is the soundest Imperial policy. I recognize the British Empire Exhibition as a successful instrument of that policy. . . . This year the Exhibition has wisely decided to present its lessons in a lighter and brighter form. All who come here must receive some prompting to serious thought on their duties and responsibilities; those who come to be entertained will remain to be educated, and will return to be further educated. . . . It was a happy inspiration to make housing and housebuilding a central feature of the Exhibition. For the foundation of the Empire is in the home; and the provision of houses in which a healthy home life is possible is a matter not only of domestic but of Imperial importance."

Immediately after the opening of the Exhibition, a formation flight of eight aeroplanes swooped down upon the stadium, and then rose again and were lost to sight. This, perhaps, was one of the most impressive items of the ceremony.

Wembley in 1925.

All who visited Wembley last year will agree that the British Empire Exhibition is the most outstanding utterance of which our generation is capable. Wembley serves as a focus of the might, the achievement, and the progress of the greatest Empire that history has known; and it is for every citizen to maintain and encourage the new phase of a vast endeavour. There are certain features of this year's Exhibition which mark the measure in which the lessons of 1924 have been mastered. As one enters, one is glad to see that the absurdly inconvenient turnstiles of last year have been removed, so that people with figures resembling that of Dr. Johnson no longer have to suffer the indignity of passing through a special gate in order to enter the grounds. Also, the entrances themselves have been made more worthy of the Exhibition. Last year the roads at Wembley left a great deal to be desired. Most of the roads within the grounds have been practically rebuilt, and the monotony of the grey surface has been relieved in places by the use of coloured gravel. The surroundings of the Lake have been greatly improved by making new rock gardens, opening fresh approaches to the shores, and reshaping the islands. As for the gardens, these are much more beautiful. The mere fact that they have had a year in which to mature means much. Besides a matter of 100,000 spring plants which are now in blossom, great numbers of new ornamental shrubs have been planted, new lawns have been made at various places, and areas which last year were neglected have been converted

MR. D. MILNE WATSON, M.A., LL.B., D.L.
Chairman of the Gas Exhibit Committee.

MR. F. W. GOODENOUGH.
Chairman of the Executive Committee.

into attractive garden patches. Last Saturday everything was running smoothly inside the grounds, and in spite of the vast crowds, no rubbish was to be seen on the paths. During the opening weeks of the Exhibition last year, proper arrangements had not been made for dealing with this problem. In another article dealing with the uses of gas in the Exhibition, mention is made of the application of gas to the destruction of this rubbish.

With regard to the lighting of the grounds, the Authorities were so pleased and satisfied with the gas lighting last year that no alteration has been made. The electric lighting last year, however—and this was readily admitted by the electricians themselves—was inadequate; and the scheme of illumination by electricity has been considerably amplified. Coloured lights among the foliage of the trees, the picking out of the architectural features of the main buildings with lights in tinted bulbs, irradiation of jets of steam—these and other devices combine to make the appearance of the grounds by night better and brighter than it was last year.

British Government Pavilion.

No section of the Exhibition drew a larger patronage or louder praise in 1924 than the British Government Pavilion. The lions on guard, the towering columns, the effect of the windows of the Royal rooms—all attracted the attention of visitors, who found their hopes of an interesting display well fulfilled within the Pavilion. This year most of the attractions remain the same. The Fuel Research Board are again showing their laboratory apparatus for the assay of coal for carbonization purposes; and charts indicate the effects of heating by coal, gas, and electric fires. As before, there is an exhibit of the Lessing coal assay apparatus. There is also an interesting and exceedingly well-drawn series of paintings showing the development of heating from early times to the present day. This illustrates graphically the desirability of using only non-smoke-producing fuels for domestic heating.

Palace of Industry.

The Palace of Industry remains very much the same as last year. Working exhibits are the rule rather than the exception. Wherever it is possible, there is movement. The practice of joint furnishing and decoration by industries or by groups of exhibitors has been recognized and is largely in evidence, so that it is easier than before to grasp the significance, extent, and variety of any representative display.

The Gas Light and Coke Company provide a stand showing their well-known products, such as tar, ammonia, and cyanogen compounds, β naphthol, cresol, &c. The South Metropolitan Gas Company display thirty-five samples of "Metro" chemicals. The stand is in the form of four towers, separating intermediates, ammonia products, coal-tar derivatives, and heavy inorganic compounds. Each tower is surmounted by a brazier containing smokeless coke fuel.

The exhibit by the Association of British Chemical Manufacturers occupies 40,000 sq. ft. This year Brunner, Mond, & Co., Ltd., are exhibiting their grey pressed bricks, which are less pervious to moisture than the common brick. Specimens of silica of soda are again shown; and two comparatively little known uses for this material are receiving special emphasis. The first is a method of road making which has had excellent results in France and Switzerland. The process is similar to that employed in the case of ordinary water-bound roads, except that a mortar of fine limestone and silicate of soda is used to bind the whole together. A great advantage to be derived from the use of silicate of soda is that the best results are obtained with soft porous chalky limestone, which is normally worthless for road construction, and in many districts can be obtained much cheaper than the hard materials. The advantages to be gained by treating the surface of concrete with a solution of silicate of soda are again being emphasized.

Nobel Industries are wisely giving prominence to the products of their various subsidiary Companies. One of their Companies—Lighting Trades, Ltd.—demonstrate the knitting, manufacture, and testing of gas mantles—a working exhibit which is attracting a great deal of attention. Chance & Hunt, Ltd., of Oldbury, are among the Companies associated with Brunner, Mond, & Co., and are exhibiting with them at the same stand, as also are the Castner-Kellner Alkali Co., Ltd.

The Graesser-Monsante Chemical Works, Ltd., show interesting specimens of phenol and cresol derivatives. The stand of the United Alkali Company, Ltd., is arranged to indicate the various products of the Company which are used for particular industries—for example, dye making, dyeing, paper and glass manufacture, &c.

Last year a section of the Palace was set apart for the display of the results of technical research; several Universities and Institutes combining to make an exhibit which rendered possible an appreciation of the enormous amount of scientific investigation undertaken in the immediate past. This year this section, which as yet is not complete, contains a model of a gas-works—unfortunately of an out-of-date pattern. There is also a model of a column-guided gasholder by Ashmore, Benson, Pease, & Co., Ltd.; the Regenerative Coal Gasification System, Ltd., have a diagram of their single-stage coal gasification machine; Babcock & Wilcox, Ltd., show a marine

MR. J. WILFRID DRAKE.

Chairman of Council, Society of British Gas Industries.

water-tube steam boiler adapted for land purposes; and there is a model of an ammonia recovery plant in connection with producer gas. A showcase contains botanical specimens, due to J. Walton, of Victoria University, Manchester, which demonstrate the part played by plants in the formation of coal. The Rose Patent Fuel Company exhibit briquettes. Other exhibits indicate the value of ammonia sulphate as a fertilizer. The "Adco" process for the manufacture of synthetic manure from straw and other vegetable residues is explained. Perhaps the most interesting exhibits in this section are the models of the Woodall-Duckham Companies, referred to on a later page.

Palace of Engineering.

Last year the Palace of Engineering told of achievement in a field which the English-speaking world has gone far to make its own. This year our needs, rather than achievements, are considered. These are better housing and better transport. In the housing section the visitor can see the varied types of houses that are intended to solve the problem of providing ample and comfortable accommodation at a moderate price. There are houses of steel and concrete, timber houses of a frankly utilitarian nature, and a concrete and oak combination. The display of building materials certainly presents many novelties. The railway exhibit occupies nearly 20,000 sq. ft. It shows not only the most modern of our equipment, but also the provisions which have been made to ensure both comfortable and safe travelling. Probably the most interesting feature of the motor section is the exhibition of mass production as applied to motor cars. The Ford Motor Company, Ltd., of Manchester, assemble cars; and an electrically driven moving platform, 100 ft. long, is seen in action. This conveyor moves between two rows of men, each of whom performs the operation allotted to him. By the time the last man has done his bit, the completed car slips from the conveyor, and can be driven away under its own power.

This year special attention has been given to caring for the children at the Exhibition, and in addition to a Children's Welfare Club, there is a "Treasure Island" which will delight the heart of any youngster. As for the Amusements Park, this is as gay and as popular as ever. As a technical and industrial Exhibition, the Wembley of 1925 cannot be considered an advance on the Wembley of last year; but there is no question that it is a brighter, more beautiful, and more entertaining place than formerly. It is to be hoped that the weather will be more favourable than it was last season. If it is, there can be no doubt of the success of the Exhibition.

"Examples in Machine Design."—This is a new volume published by Sir Isaac Pitman and Sons, Ltd. (price 6s. net), and written by G. W. Bird, W.Ex., B.Sc. It contains many typical designs illustrating standard engineering practice, and is suitable for students taking this subject for an engineering degree examination.

THE GAS SUPPLY TO THE BRITISH EMPIRE EXHIBITION.

By G. L. Jennings, Deputy Chief Inspector, Brentford Gas Company.

The second Exhibition at Wembley will be supplied with gas by the Brentford Gas Company.

Readers of the "Journal" are aware of the provisions that were made by that Company last year to afford the necessary quantity at a proper pressure; these remain practically the same as before. The gas is taken into the Exhibition through an 18-in. main, and the whole of the gas is supplied to the Exhibition Authorities, who are responsible to the Company for payment of all gas consumed in the Exhibition. This is advantageous, as a large quantity of it is consumed by the Exhibition Authorities direct. As a result, supplies to lavatories where gas is employed for the production of the necessary hot water, to lamps, Exhibition offices, fire stations, ambulance stations, &c., need not be metered, unless the Authorities desire to check the amount actually used at any particular place. All other consumers obtain their gas through the Authorities; and the amount is registered on various meters. In practice this is found to be the best method of dealing with large Exhibitions, as it reduces considerably the number of meters required.

Satisfactory Supply.

The mains remain as before—a 12-in. circular main round the area, from which subsidiary mains of 6-in. and 8-in. diameter are carried. These are available for the necessary supplies to the exhibitors. The larger buildings—the Palaces of Industry and Engineering—are traversed by these mains, so that at practically any point a supply is available. The mains inside the Exhibition amount to a little over seven miles; and last year no shortage of gas was found at any point. As a matter of fact, with the exception of one from a consumer who doubled his use of gas without increasing the size of his meter, there was no complaint of any sort throughout the season.

Extended Uses of Gas.

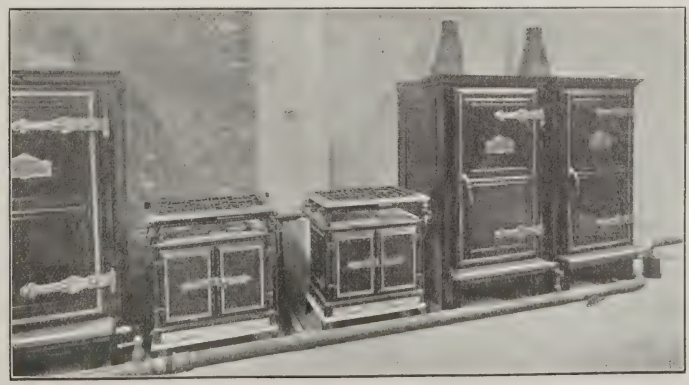
Gas will be used this year for practically the whole of the catering. Previously Messrs. J. Lyons & Co. did this catering, but this year it has been split-up among a number of firms. The gas apparatus installed by Messrs. Lyons, however, remains for the use of their successors. In addition the catering has been considerably extended; new buffets and cafés having been fitted up. There is now the "Excursionists' Restaurant," situated in the Palace of Transport and Housing, and so arranged that 7500 people can be dealt with for breakfast, lunch, tea, or dinner. It will not be available for the general public using the Exhibition, but will cater, as its name implies, for large bodies of excursionists visiting Wembley. Messrs. Allnatt's are running this special restaurant. To ensure quick service to so large a body of people, gas-heated hot closets in groups in various positions have been fitted, so that, after the joints have been cooked in the large gas roasting ovens (capable of roasting 2 tons of meat at a time), they can be kept hot and quickly served from the various groups of carving tables. There will be over twenty of these gas-heated carving tables in the dining hall. The vegetable cooking and necessary auxiliary services are dealt with in the kitchen; and for this purpose a 6-in. supply has been taken in, and an 800-light meter installed. It will probably be much the largest restaurant in the Exhibition. In addition, new cafés, with gardens, will be found behind the "Witching Waves" and close to the "Great Racer." Further buffets have also been installed in the Palace of Industry.

The Ceylon building, which originally had two tea kitchens, has now an additional large kitchen which will be run by Messrs. Gunters. The hot water for washing-up purposes will be supplied from two Potterton boilers; and gas apparatus has been installed for dealing with the necessary cooking. The Brentford Gas Company's "Regulus No. 1" cookers are in use for this purpose. British Guiana have also installed gas-heated apparatus to enable teas to be served in their exhibit. It is evidently the intention of the catering firms to see that full provision is made for dealing with the needs of the large number of people who are expected at the Exhibition this year. Additional gas supplies have been taken to the Gas Exhibit this year; and the main portion of the Exhibit, which was previously supplied with 300-light and 80-light meters, will now call for two 300-light meters.

General Exhibitors and their Requirements for Gas.

Messrs. Carsons, the chocolate and confectionery firm whose exhibit and the whole of its working parts were driven by a Bonecourt boiler last year, have now installed one of greater capacity, and a 500-light meter has been fitted in place of the 250-light meter they previously had. Messrs. Baker Perkins are also calling for larger supplies of gas in connection with the gas-heated travelling ovens they are installing. West Africa also have demanded a larger supply. Other exhibitors are Messrs. Brown & Polsons, Messrs. Horlicks, Messrs. Poppetts, and Messrs. Burnards & Son, who are requiring large supplies of gas in connection with a gas-heated steam boiler. A 200-light meter has been installed for them. They are fitting a Cochran boiler, entirely heated by gas. An idea of the size of this will be conveyed by the fact that it is capable of generating 15 H.P. It will be used chiefly for the manufacture of ice cream for the exhibition; it will work in conjunction with an ammonia plant, and is capable of delivering ice in large quantities. The temperature of the rooms used for ice making will be 20° below zero—over 50° of frost. In addition, the steam from this boiler will be used for sterilizing and washing the milk apparatus. This exhibit will be well worth the attention of those interested in the use of gas. Messrs. Grimble & Co., in the Palace of Industry, Messrs. Green & Gordon, the Polivit Manufacturing Company, Messrs. Oxo, Messrs. Entwistle & Kenyon—all are using gas. Additional supplies have been laid to New Zealand and to the Anglo-Indian Pavilion. Then there are the Pure Confectionery Company, the Price Candle Company (who use gas in connection with the melting of wax and the making of candles), Messrs. Geiple, Messrs. Levey & Co., Messrs. Nobel, the Gourm Manufacturing Company, and Messrs. Maynards (for the manufacture of sweetmeats, &c.).

In addition to the gas required for catering and by exhibitors, the Exhibition Authorities need a large amount in connection with their staff requirements. For instance, gas-heated geysers are installed in various places for the use of the members of the Fire Brigade, the ambulance stations, and for the production of hot water in the lavatories. That this quantity is considerable is shown by the fact that during the period while the Exhibition was closed to the general public—that is to say, from the beginning of November last to the beginning of April—the amount of gas consumed in the Exhibition was 4¾ million c.ft. This quantity will, of course, be considerably increased as soon as the Exhibition is opened.



EXCURSIONISTS' RESTAURANT, SHOWING FLETCHER RUSSELL ROASTERS AND "REGULUS" COOKERS.

EXCURSIONISTS' RESTAURANT, SHOWING GAS COPPERS AND THE METER.

Lighting.

The general lighting of the Exhibition will be as before. There has been practically no change in this so far as gas is concerned. The lamps will be Messrs. Staniforth's 16-light "Wembley" type; and though the Amusement Area will present a new appearance through the re-arrangement of buildings, the lighting will remain as before. It gave great satisfaction to the Authorities last year; and they have decided to let it remain. It was hoped that there would be a considerable extension of this; but owing to the circumstances in which the Exhibition Authorities were placed, they have not seen their way to extend it.

In connection with the gas lamps in the Amusement Area, the method of arriving at the consumption of these was to meter a certain number of them, and then take the average consumption, which was under 34 c.ft. per lamp per hour. Having regard to the fact that each lamp had 16 mantles, and that the lamps were kept at their maximum efficiency, this is a figure which is quite satisfactory. The maintenance of the lamps will again be carried out by the Brentford Gas Company, who keep a special staff of maintenance men for this work. Every lamp is inspected daily, and the glass cleaned. In dry weather it is found that dust renders such daily cleaning necessary, in order to ensure the best results being obtained.

Gas and Electricity.

Reviewing the position generally, it is expected that the amount of gas consumed in the Exhibition this year will exceed that in 1924; though this must to a large extent depend upon the weather. The figures published of the number of heat units supplied to the Exhibition last year by the Brentford Gas Company may be of interest. They show the extraordinary preponderance of gas, calculated on a heat basis, over electricity. The figures were: Gas, well over 40,000 million B.Th.U.; electricity, slightly over 30,000 millions.

GAS IN THE CATERING ESTABLISHMENTS.

The figures given by the Chairman of the Brentford Gas Company, showing a very large consumption of gas at the Exhibition, have naturally drawn attention to where this amount is being used. In another article are described some of the directions; but it is felt that the catering at the Exhibition, and the gas consumed by that catering, have not been sufficiently dealt with.

In this article is given a description of some of the gas appliances fixed in the British Empire Exhibition. Last year the whole of the catering was done by Messrs. J. Lyons & Co., and the kitchens were all laid out by them according to their usual scheme for catering. When Messrs. Lyons decided to discontinue their contract, the kitchens were left by them fitted with all the apparatus, and available for whatever firm took over the work. The majority of these firms have continued with this apparatus, as described, and some have added additional appliances. In the following, the individual kitchens are described.

The Grill Room.

The large Grill Room is being run this year by Gordon Hotels, Ltd. This is probably the most important restaurant in the Exhibition grounds, and is the one in which most gas is used. It is supplied by two 500-light meters off a 6-in. main, and coupled to 4-in. supplies; the outlet runs are also 4 in. The kitchens, which are very roomy, contain large roasting ovens, and a special battery of Cox grills capable of dealing with a great number of chops and steaks. The roasting ovens and hotplates here are 15 ft. long. There are four of these hotplates, which can deal with enormous quantities of foodstuff. The salamanders are important; and there is a large installation of these. The consumption of gas in this kitchen at busy times averages as high as 8000 c.ft. per hour. The large carving tables are gas heated. This Grill Room was originally fitted by Messrs. Lyons, who fully realized the advantages of using gas in any operation for which it was feasible.

The Bank Café will be run this year by the Aerated Bread Company. This is the Café which at one time was known as the "Electric," though the amount of electricity used in it, so far as cooking is concerned, was *nil*. It is fitted with a Wright's "Eureka" cooker, a large fish frier with triple pans, a large gas-heated hot closet and a hot table fitted with Keith & Blackman's new self-cleansing burners. These burners have been installed in very large numbers throughout the Exhibition. They are fitted with a convex cap, and are surrounded by refractory material. The flame plays upon this, and cannot be stopped by reason of the spilling of any sugar or fat. If any is spilt, it is promptly burnt, and falls off. There is a 150-light meter here, and the service to this café is 3 in., fed from the 8-in. main laid in the Avenue.

The Wembley Garden Club.

The restaurant previously known as the Lùcullus is now part of the Wembley Garden Club. The gas is supplied to this by a 300-light meter made by the Gas Meter Company, fitted with 4-in. supplies.

All meters throughout these cafés are controlled both on the inlet and outlet, so that in the case of exchanging a meter, the work can be done very quickly.

The kitchen is fitted with two "Falcon" stoves, made by the Falkirk Iron Company, with six ovens each and six boiling burners. There is a large Keith & Blackman boiling burner of the self-cleansing type; two double-tiered salamanders, and two double-tiered roasters. The hot closets here are heated by steam; and the boiling water is obtained from Still boilers. In addition there are a number of gas-heated closets.

The Colonnade Café is being run by the Aerated Bread Company. It has a 150-light meter and a 4-in. service. There is a hotplate here, fitted with a Keith & Blackman triple burner of the cleansing type, as previously described; also an 8-burner Keith hotplate, a gas-heated hot closet, a large gas-heated fish frier, two four-tiered Cox grills, a Wright's "Eureka" cooker, Still boilers, small toasters, additional gas-heated urns for milk, &c., egg boilers, and toasters and egg poachers combined.

The Orange Tree Buffet, previously the Garden Buffet, is supplied by means of a 2-in. service and a 100-light meter, and is fitted with gas-heated apparatus chiefly for producing hot water for teas.

The Tree Buffet is being run by Messrs. Bertram & Co. This buffet is very well named. It has two trees growing through the centre. It was felt desirable that as many trees as possible should be retained; and this is one of the few places

BROOK RESTAURANT (A.B.C.), SHOWING COX'S GRILLS AND ROASTERS.

where they are actually inside the building and growing through the roof. Visitors to the Exhibition should certainly see this interesting sight. The boiling water is produced in this buffet by means of Still boilers, of which three large ones are installed. The hot water for washing-up purposes is obtained from a Keith & Blackman circulating boiler. There is a 3-burner hotplate of the Keith & Blackman cleansing type, and a Wright's "Eureka" cooker. A 100-light meter and a 3-in. service supplies this buffet. The equipment here is typical of the whole of the buffets throughout the Exhibition, so that I do not intend to describe the remaining ones.

The Colonnade Restaurant, a "quick-lunch" café, is run by Messrs. Bertram. It is fitted with a Wright's "Eureka" cooker, a Keith Blackman circulating boiler, hotplates by the same firm, and Still boilers.

The North Institute deals with the supply of food to the workmen, and feeds a number of the employees in the Exhibition. It is fitted with Keith & Blackman hotplates, and large roasting ovens made by the Falkirk Iron Company. The boiling water is supplied by Still boilers. There is a 100-light meter and a 3-in. supply. The latter is carried on concrete piers across the brook which runs through the grounds. It can be seen under the Non-Stop Railway, adjoining the Wembley Park entrance to the Exhibition. It is a Mannesmann steel main, supplied off the 10-in. main carried through the Amusement Park.

Into the Brook Restaurant, which was previously known as the Popular, the Brentford Gas Company carried a 6-in. main, to which is attached a 500-light meter by Messrs. Parkinsons. There are two large roasting ovens made by the Falkirk Iron Company, a battery of four Cox grills, gas-heated fish frier, four large hotplates of the self-cleansing type, two salamanders, gas-heated hot closets, and a battery of Still boilers.

The Dancers Café is supplied through a 3-in. service and a 100-light meter. Its equipment is similar to the other cafés.

The Central Café, previously the Regent, is being run by Messrs. Buzzards, and is a very good example of a gas kitchen. It was, of course, originally fitted-up, as all the other kitchens were, by Messrs. Lyons; and this, to a great extent, accounts for the similarity of the installations. It contains a gas-heated hot closet, a battery of Cox grills, large gas-heated ovens with hotplates 15 ft. long, large batteries of double-tiered salamanders, three large roasting ovens, and six Still boilers. In the pastry kitchen is installed a "Falkirk" pastry oven, together with Keith & Blackman's hotplate, with self-cleansing burners, for making custards, jellies, &c. This restaurant is supplied by a 500-light meter off a 6-in. main, and the kitchen is one of the best in the Exhibition. The premises are well ventilated and of adequate size.

The Harmony Restaurant, which is being run by Messrs. Bertram & Co., is a "quick-lunch" café. This has a comparatively small kitchen, and is supplied through an 80-light meter.

The Grand Restaurant, which the Gordon Hotels are running this year, is fitted with large pastry ovens, two double-tiered salamanders, two large hotplates with ovens, and two large gas roasters. The meter supplying this is a 300-light, with 4-in. connections. This also applies to the buffet adjoining, where the installation is chiefly used for boiling water for the provision of teas. Still boilers are in use here.

The Veda Café is now run by the Veda Bread Company. This has the usual equipment of an ordinary café, with extra cooking capacity; and for this the Brentford Gas Company's "Regulus No. 1" cooker is in use.

South East Institute.

There is also the South East Institute catering for employees of the Exhibition. The equipment of this is very similar to the North Institute, which has already been described. They are both run by Capt. Symons, V.C. The Institutes are naturally a great boon to the large number of people who are employed

BROOK RESTAURANT, SHOWING KEITH-BLACKMAN HOTPLATES AND SALAMANDER.

ENGINEERING EAST (HAYMARKET HOTELS).

in patrolling and caring for the grounds and gardens, and generally seeing to their welfare. It is important, of course, that meals should be ready quickly. For this purpose, gas has proved its efficiency, and is generally adopted for any purpose for which it can be used. To this Institute a 3-in. supply has been run, and a 100-light meter fixed.

The Institute is situated near the refuse destruction apparatus of the Exhibition, which gave great trouble last year. It was found that the wet refuse, orange peel, &c., would not burn freely, but smouldered and caused large volumes of smoke, which proved annoying to the visitors to the Exhibition when the wind was in a certain direction. The Brentford Gas Company volunteered their assistance; and each of the incinerators was fitted with a powerful gas burner. The effect of these burners was felt at once. Instead of the refuse being difficult to deal with, and causing great annoyance, it was very quickly burnt, and with practically no smouldering.

In this portion of the Exhibition are the living quarters of the natives. They are located in wooden huts; and the Brentford Gas Company have carried-down a supply of gas, to do some of the necessary cooking for them. The plant has been installed here by the Gas Light and Coke Company, under the supervision of Mr. Smithers.

Chinese Restaurant.

The gas equipment of the Chinese Restaurant in the Hong Kong Section was also installed by the Gas Light and Coke Company; and for this again Mr. Smithers was responsible. It consists of three large hotplates specially designed to meet the requirements of the Chinese cooks, a small hotplate, a "Regulus No. 1" cooker, and two gas-heated coppers. The necessary hot water for washing-up purposes is provided from a Ewart "Califont" geyser, and water is supplied by a gas-heated boiler by Messrs. John Harker & Co. There are also small vegetable steamers by Summerlings. The supply is through a 100-light meter off a 2-in. service.

The City of Bath utilize gas to illustrate their natural hot springs, for which Bath is so well renowned. The water is heated by means of a "B.T.U." boiler, and a thermostat is used so that the temperature of the water is the same as that available at Bath. In practice the boiler is found to carry out the work of throwing up and circulating the hot water in a very efficient way.

I have already, in a previous article, described the new kitchen of Ceylon. In addition, the two old kitchens will be used for cooking. There are two Keith & Blackman water-boilers, Still boilers for tea making, and a small hotplate in each of the kitchens.

In South Africa a new restaurant is being installed. There are a Keith & Blackman circulating boiler, a hotplate fitted with the self-cleansing burners, Still boilers for the necessary boiling water, and Still grills for toasting scones, &c. It is supplied off a 2-in. service and 100-light meter.

The Stadium.

In the Stadium, through the tunnel, a 6-in. supply is carried, connecting with a 4-in. main which supplies the Stadium kitchens. The Stadium restaurants are being run this year by the Dominions Catering Supplies, Ltd. The main restaurant has a very large dining hall. There are kitchens at each end, and a 300-light meter with 4-in. connections is installed in each. They have double-tiered salamanders, a large gas-heated hotplate, gas-heated hot closets, large "Falcon" roasters—these are of particularly large size—a gas-heated fish frier, three Still

ENGINEERING WEST (MESSRS. PRITCHARDS).

PALACE OF INDUSTRY EAST.—A.B.C. KITCHEN, SHOWING FISH FRYER, GAS OVENS, AND SALAMANDERS.

oiling burners for the necessary boiling water, a number of as-heated milk urns, and a large gas-heated toaster and egg oacher combined, of the pattern used by Messrs. Lyons.

There is a 4-in. main right round the Stadium. This is fed rough the 6-in. main already referred to; and there is a 4-in. ain on the other side of the Stadium.

Around the Stadium there are eight buffets. These are fitted ith Still boilers for the necessary boiling water, and Keith-Blackman circulating boilers for the hot water for washing-up lasses, cups, &c. The whole of the buffets are fitted in identically the same way.

The New Café is supplied by means of an 80-light meter off 3-in. service. Here there is a Wright's "Eureka" cooker, ve boilers for the necessary boiling water, a gas-heated hot loset and milk urns, and a large hotplate with four Keith-Blackman burners. This café is run by MacFisheries.

A new departure is a Gentlemen's Hairdressing Saloon. The ecessary hot water is supplied by a Ewart's "Radion" ylinder.

In close vicinity to this saloon are the new premises of the t. John Ambulance Brigade. The Brentford Gas Company ave fitted-up gas fires here, so as to ensure the necessary armth in case of accidents or any emergency.

The Alderman Café is supplied by an 80-light meter off a -in. service. It is fitted with a large Keith & Blackman hotlate, gas-heated egg boilers, three Fletcher Russell toasters, ve Still boilers, and a number of gas-heated milk urns; also Wright's "Eureka" cooker.

Each of the catering firms has an Administration Office, to acilitate the necessary control and supervision of their organiations. To each of these a gas supply has been run. In these remises the pasteurization of milk is carried out, which is then istributed to the various cafés, buffets, &c.

There is a South-West Institute for the Exhibition employees. his is installed with gas appliances in the same way as the Vorth and South-East Institutes.

West Africa.

Messrs. Buchanan Scott, Ltd., are doing the catering in West frica. There is a Still boiler for the production of hot water, Keith & Blackman circulating boiler for washing-up purposes, hotplate fitted with the new self-cleansing burners, and a No. 1 "Regulus" cooker. This is supplied by a 150-light neter off a 3-in. service.

In Nigeria there is a 300-light meter installed, for running large Spencer-Bonecourt boiler. The evaporating power of his boiler is 3000 lbs. per hour. The power will be used for rushing nuts and extracting oil. There is a 4-in. supply.

The Indian Restaurant is being run by Messrs. Veerasawmy. t is fitted with three "Regulus" cookers, three large Keith & Blackman hotplates and double-tiered toasters, two Cox grills, a large gas-heated hot closet, additional boiling rings, &c., together with a 4-panned fish frier. This is supplied by a 200-light meter with a 4-in. supply. The boiling water is supplied by Still appliances.

Engineering and Industry Restaurants.

The Engineering East Restaurant is being run by the Haymarket Hotels. The supply is through a 400-light meter; and here again there are gas-heated fish friers, batteries of Cox grills, Wright's "Eureka" stove, Keith & Blackman boiling rings, salamanders, and toasters, and Still boilers for the production of the hot water. In the kitchen above is a similar equipment, with additional large roasting ovens and gas-heated egg poachers.

In the Engineering West Restaurant there is the usual equipment of a large kitchen—toasters, hotplates, Cox grills, egg poachers, fish friers, and two Portway "Tortoise" stoves. This stove is spoken of very highly by Messrs. Pritchards, who are running this restaurant. They say that they have had these stoves in operation in other of their branches, and they have given great satisfaction. The kitchen above is similar, and shows practically the same apparatus. We show a photograph of the stove referred to. A 400-light meter is fitted here with 6-in. supplies.

In the Industry East Restaurant, which is being run by the Aerated Bread Company, there is a 400-light meter and 4-in. supplies. They have installed two Richmond large roasters, a Keith & Blackman hotplate, a large fish frier, gas-heated carving tables, batteries of Cox grills, Still boilers, gas-heated milk urns, hot closets, &c. The kitchen above and the Palace of Industry West Restaurant are practically identical.

Children's Welfare.

With regard to Children's Welfare, it might be advisable to mention the preparations made for the reception of children who are lost in the Exhibition and require care. For this they have installed gas fires. An Edgar geyser supplies the necessary hot water for emergencies, and gas-heated appliances are fixed for cooking any food required.

The Domestic Grate.

Technical Paper No. 13 of the Fuel Research Board has just been published. Entitled "The Domestic Grate," this is an account of an investigation, by Dr. Margaret W. Fishenden, of the relation between the design of a grate and the heat radiated into a room. In a brief summary the author states that the following are important factors in the efficient utilization of open fires for warming purposes: (1) The use of correctly-designed grates, properly fitted, in order that the maximum possible proportion of the radiation emitted by the incandescent fuel may be directed into the room; (2) the provision of adequate draught control, so that not only may the fire be rapidly adjusted to meet varying requirements, but also the air flow through the room be reduced to the minimum consistent with the demands of hygiene and comfort; and (3) efficient insulation of the room, so that the temperature rise effected by a given energy input may be as great as possible. Dr. Fishenden mentions that the very gradual rise in temperature which an open coal fire induces in a room is one of its most serious drawbacks, especially for intermittent use. It is just during the period immediately following the kindling of the fire, when the room has not yet had time to get warmed-up, that a maximum amount of radiation is needed for comfort; and actually, at this stage, the fire is giving a minimum radiation emission. It is stated that it is doubtful whether the radiation efficiency of open coal fires against a wall can easily be increased beyond 30 p.ct. or 35 p.ct. of the theoretical energy of combustion. The publication is obtainable from H.M. Stationery Office, Adastral House, Kingsway, W.C. 2, price 9d. net.

THE GAS EXHIBIT.

There is evidence of the bestowal of great thought and much work on the British Empire Gas Exhibit, 1925—and thought and work of a kind that will be abundantly rewarded, given the fine weather that should spell huge attendances at Wembley. There is no need to compare this year's display with the excellent and thoroughly successful effort of 1924; but it is manifest that certain circumstances have favoured the present occasion. For one thing, there is available considerably more ground space, which has been taken advantage of to provide, for one thing, a separate Demonstration Hall, in which a knowledge of cookery, and of the efficient use of gas for the purpose, will be imparted to those desirous of acquiring it under conditions of greater comfort than were possible last year. And in planning the 1925 exhibit, of course, those responsible have had the experience of 1924 to guide them in the fixing-up of various details. In addition to this, the Committee, by good fortune, have had the opportunity, as explained towards the end of the following account of the exhibit, of introducing this year two special features which must make a wide appeal.

Gas is again worthily represented at Wembley, and for this the gratitude of the industry is due to Mr. D. Milne Watson (the Chairman) and the members of the British Empire Gas Exhibit Committee, to Mr. F. W. Goodenough (Chairman of the Executive Committee), to Messrs. J. E. Henwood and J. C. Walker (Joint Hon. Secretaries), and to Mr. A. E. Broadberry (the Hon. Treasurer). Mr. H. Austen Hall, F.R.I.B.A. (Architect to the Committee), has again given of his best; while the work of the contractors (Messrs. Osborne & Co.) has left nothing to be desired.

The Exterior.

Approaching the Gas Exhibit by way of the familiar avenue through the Palace of Industry, one is immediately influenced by the appealing nature of the exterior. This is a good thing; for everyone knows the importance of first impressions. And the favourable impression being made, further investigation will surely follow.

There has been painted as a background to the whole of the front of the building a very artistic view of a gas-works—not such a picture as is too often associated with a gas-works in the minds of the public—and the whole of the space on the outside has been given over to industrial exhibits. This imparts the atmosphere of life and movement which experience has shown to be so important in connection with displays to attract the close attention of the general public.

Last year, it will be recalled, there was on the one side of the main entrance to the Gas Pavilion a smoke abatement exhibit, and on the other a sulphate of ammonia display. Both these proved exceedingly popular—particularly from an educational point of view—but it was felt, nevertheless, that the smoke abatement exhibit especially, convincing and well arranged as it was, lost considerably in effect from the magnitude of the Palace of Industry under whose spacious roof it was placed.

Therefore, in that space—*i.e.*, on the east side of the porch—there have now been placed a big gas engine of 180 H.P. over 9 ft. high, and a smaller one of only 20 H.P., each illustrating the use of gas for power. Adjoining these is a 10-ft. long gas-fired travelling oven, showing wafer or biscuit baking in actual operation.

On the other side of the porch, where formerly was the sulphate of ammonia exhibit, the many applications of gas to the motor manufacturing industry are demonstrated, and emphasis given to the value of benzole as a motor spirit. The space is "flood-lighted" by high-pressure gas lamps installed on "benzole roadside pumps" in lieu of ordinary columns—the necessary pressure being afforded by the motor engine that is shown being "run in" by gas, which is more economical for the purpose than petrol or benzole. There are here, in addition to the chassis of a motor car, all the appliances in which gas is used for making the parts of the car.

Overseas Dominions Hall.

Having seen so much of general interest on the outside, the visitor will wish to examine the further attractions that he will feel convinced await him on the inside. Entering through the porch between the two exhibits just referred to, he will find himself in what has been named the Overseas Dominions Hall; and there will be no desire to leave it before a thorough inspection has been made of the contents.

The great point that the British Empire Gas Exhibit Committee are wanting here to bring home to people is that gas is still a vigorous and growing industry, which is, in fact, increasing in activity day by day, not only here but in other parts of the world; and hence they have, by means of the display in this hall, linked-up the industry with Overseas. The result will interest everybody, and will serve to remove from that portion of the public mind which still harbours it the idea that the gas industry is simply carrying on in the Old Country because it was started there, and is not making headway elsewhere. The true position is, of course, that the gas industry is "going strong" throughout the Empire's wide Dominions. There are, indeed, some 200 undertakings which manufacture gas in Australia, New Zealand, and Canada alone; and their business is steadily growing in dimensions. This last remark does not even exclude Canada, where electricity is extraordinarily cheap.

To press home the point they had in view, the Committee have illustrated in the Overseas Dominions Hall—which is, it must be unnecessary to say here, throughout lighted by the most efficient and artistic gasfittings—the multifarious service of gas in the homes of the Empire; but the apparatus shown is all of a type equally suitable for homes in the Mother Country. City scenes in the Dominions Overseas have naturally been chosen; and it is well known that the more luxurious homes in those Dominions mostly show a marked English influence. This will make the exhibit thoroughly practical from the point of view of the use of gas in this country. Each corner of the hall is occupied by a domestic scene from one of the greatest Overseas Dominions—Canada, Australia, South Africa, and India—and across these corners are the coats of arms of the Dominions, modelled in plaster and brilliantly coloured.

Canada.—The Canadian scene depicts an entrance hall, and shows gas-heated radiators supplemented by a gas fire in one corner of the room. Out of this hall will be found a "Kitchenette" showing the arrangements and equipment for cooking purposes in the average Canadian home. Everything is close to the hand of the cook, and the gas cooker is of the most modern type—raised so that no stooping is necessary, and provided with an automatic heat regulator, &c. From the window of the hall can be caught a glimpse of a typical Canadian landscape.

Australia.—In the opposite corner Australia is represented by a delightful children's nursery, the windows of which reveal the famous view of Sydney Harbour. Out of the nursery opens the children's bath-room—a very attractive place for the youngsters, with strange fishes depicted on the tiles around the upper half of the room. The bath itself is slightly sunk. This scene, of course, displays gas water-heating apparatus.

South Africa.—The South African tableau depicts an old Dutch-interior sitting room, with the brick fire-place adapted for use with a gas fire. The furniture is typical old Dutch hard wood; the seats of the chairs and settee being composed of strips of hide.

On one side of this sitting room is a kitchen or "still room," where fruit bottling will be in constant operation. Although this is next door to South Africa, it is not intended to link it too definitely with that country, since both Australia and Canada have large fruit-bottling industries; and, by means of publicity matter, this scene can be connected with all three Dominions.

India.—India shows a bathroom with a gas water heater and a pantry next door with a refrigerator operated by gas, providing small blocks of ice convenient for use in drinks, and ice creams and other forms of set dishes, as well as the cold storage so essential in the climate of India. On the other side of the bathroom has been arranged a strip of verandah, where the dummy figure of a native seated illustrates the brilliantly coloured materials so beloved of the natives, which owe their colouring to the dyes obtained from coal tar.

New Zealand.—The remainder of the space on one side of the hall is occupied by a tableau representing New Zealand. This consists of a luxurious bedroom and boudoir, the window of which look on to beautiful typical New Zealand scenery.

A Pioneer's Store.—On the opposite side of the hall there is the interior of an up-country store, such as the pioneer depends upon in every Colony or Dominion. The contents of this serve to illustrate the manifold resources and uses of the gas industry—the whole of the stock being either bye-products of the gas industry, such as disinfectants, drugs, fur preservatives, sheep dip, &c., or articles in the manufacture of which either gas or one of the many bye-products of gas making is habitually used. This exhibit will prove excellent for emphasizing the wide spread use in industry of gas and its bye-products.

The cabin has not been linked-up with a particular Colony because it may apply to any one.

Gas Fire Exhibits.

In the centre of the Overseas Dominions Hall are three hexagonal pylons as last year, each showing six different types of gas fire in all kinds of suitable fireplace surrounds, varied from those shown in 1924.

The decoration of the hall itself is in white; and the ceiling consists of cream-coloured gauze stretched over batons—the general effect aimed at being that of a more sunny climate than is usually experienced in this country.

A Luxurious Lounge.

A charming Queen Anne period lounge has been arranged in the space which joins the hall just described and that to which reference will now be made. It is handsomely panelled

and opportunity has been taken to display a very fine gas fire of appropriate design.

The Hall of General Exhibits.

Entering from the lounge the second hall—known as the Hall of General Exhibits—and turning to the right, there is found first a garage and chauffeur's workshop, illustrating the applications of gas to the heating and lighting of a private garage by means of safety gas-heated radiators and safety gas lamps, and the uses of gas for brazing, vulcanizing, &c.—so helpful to a chauffeur-mechanic. Next to the garage are the chauffeur's parlour-kitchen and scullery, fitted with a gas cooker, gas-heated copper, water heater, iron, a gas fire, and, of course, gas lighting fittings.

Smoke Abatement Exhibit.

On the opposite side of the Hall of General Exhibits the chief feature is a smoke abatement exhibit, consisting of two rooms identical in decoration and furnishing—the one showing a coal fire polluting the atmosphere with smoke and making everything inside the room dirty, while the other demonstrates the scientific use of coal (by its treatment at the gas-works, and the distribution of its purified "spirit" in the form of gas) and the cleanliness and brightness that would be our heritage if open coal fires were unknown in London.

By means of theatrical lighting effects, the windows of the first room look-out on a foggy scene, and those of the second room on to a nice clear sky.

Gas for Various Purposes.

The Greenhouse.—Next to the smoke abatement exhibit is a greenhouse heated from without by a gas-fired boiler, and containing an attractive display of flowers.

The Shop Window.—Adjoining this greenhouse, and flanking the northern entrance to the exhibit, there will be found a shop window showing effective gas lighting of such premises, and containing an interesting display (suitable for a gas company's showroom window) illustrating the many bye-products of different kinds obtained from the carbonization of coal, but lost if coal is burned in open grates.

The Domestic Laundry and All-Gas Kitchen.—On the other side of this entrance, there has been erected a working domestic laundry suitable for a large house or private hotel, and alongside it a model all-gas kitchen suitable for such a house.

The Hotel Kitchen.—Opposite to this is a complete hotel kitchen containing gas apparatus suitable for every description of cooking.

In the space where the cookery demonstrations were held last year, a number of armchairs for the comfort of the public have been placed.

Converted Coal Grates.—The central space in this hall, which was in 1924 taken up by industrial working exhibits, is this year occupied by a demonstration of how gas fires can be installed in front of existing coal grates, so as to make a harmonious heating unit.

Hobbies and Pottery Making.—There is also a working display demonstrating how gas is applied to many hobbies; and a very interesting show of pottery-making by the disabled ex-Service men employed at the Ashtead Pottery.

Lecture and Demonstration Hall.

Beyond the west end of the Hall of General Exhibits has been provided—and it will certainly be regarded as a great improvement upon last year's arrangements—a separate quiet hall 50 ft. square, which will be devoted to frequent practical lectures and demonstrations for the assistance of housewives in securing the most efficient and economical results from the use of gas, not only for cooking, but also for all other domestic operations involving the use of heat or light. Around this Demonstration Room will be found a selection of the most up-to-date gas cooking, water heating, and other catering appliances; and also a very interesting installation of gas-heated fish-frying apparatus, which is becoming popular in the trade.

The present arrangement has, of course, enabled a lot more apparatus to be put in than was possible last year—which should lead to the enhanced satisfaction of all concerned.

A Coke Exhibit.

A space between the Demonstration Annexe and the main gangway has been taken by the Gas Light and Coke Company, who are making, at their own cost, a special display of coke appliances, mainly for domestic use.

Here are to be seen an artisan's kitchen, a model kitchen, and a bathroom, showing different types of open grates using coke, and an anthracite stove running on coke, as well as several types of coke boilers, both working and otherwise. Here are shown in use the different sizes of coke suitable to the varying requirements. In fact, it is convincingly demonstrated that coke can displace coal for any domestic purpose.

Prof. Boys' barless grate for the consumption of coke is on view, as are also some models of industrial appliances for use with coke.

The Side Gangway.

Along the side gangway are exhibits of gas appliances for use in various industrial processes, together with samples of the finished products in the making of which gaseous fuel is employed. These appliances include furnaces, crucibles, ovens, and blow-pipes of all descriptions. The finished products comprise motor gears, false teeth, printers' type, pea nuts, toy soldiers, engravers' dies, buttons, tools, aluminium castings, pottery, rivets, sweetmeats, varnished toy models, feathers, glass bulbs, telephone magnets, &c.

Empire Food Stuffs.

Since arrangements were made for a separate Demonstration Hall, a Special Committee for organizing propaganda for

A SCENE IN THE GAS EXHIBIT ON SATURDAY.

[Other Photographs of the Completed Exhibit will appear in Succeeding Issues of the "Journal."]

increasing knowledge and use of Empire Food Stuffs in the Home Country (presided over by Lady Galway, who is Chairman of the Executive of the Women's Section of the B.E.E.) have asked for the assistance of the British Empire Gas Exhibit Committee in the matter of lectures and demonstrations in the Cookery Demonstration Hall on the purchase, preparation, and cooking of Empire Food Stuffs. The Gas Exhibit Committee have agreed to lend the hall and to provide the lecturers and demonstrators—who will be furnished with all necessary information by the Empire Food Committee—and to arrange, in consultation with the Empire Food Committee, a programme of daily lectures and demonstrations to fit in with those already being planned on gas cooking and other aspects of domestic economy in which gas plays an important part.

The Gas Exhibit Committee will exercise full control over all plans. The Women's Section of the B.E.E., in conjunction with the Gas Exhibit Committee, will arrange for widespread publicity, and for well-known men and women, both from the Home Country and the Dominions, to take interest in the scheme, as well as for their frequent attendance to preside at lectures, give receptions, and otherwise show their sympathy with the movement. H.M. The Queen is Patron, and H.R.H. The Duchess of York is President, of the Women's Section.

Society of Women Journalists.

Inquiry was lately made by the Society of Women Journalists as to whether it would be possible for the Gas Exhibit Committee to afford women journalists visiting Wembley—not only from London, but from the Provinces, and also from the Dominions and Colonies—some accommodation for rendezvous, rest, writing, &c. The Committee immediately offered, and the Society gratefully accepted the offer, to fit-up for their use as a reception bureau a suitable room in the offices that had been constructed behind the Demonstration Hall. This room has been furnished free by Messrs. Osborne & Co.

Upon this special feature, and the arrangements that have been entered into in connection with Empire Food Stuffs, the Gas Exhibit Committee should be particularly congratulated; for they must result in making the exhibit a centre of interest for all women visiting Wembley, and at the same time ensure an exceptional amount of publicity.

BRITISH ROAD TAR EXHIBIT.

National Gas Council Display.

[*See Illustration on p.* 465.]

"British Tar for British Roads" would seem to be the slogan of the road tar producers who have organized a display at Wembley. The initiative has been taken by the National Gas Council, who acquired 1500 ft. of space in the Chemical Section of the Palace of Industry for an exhibit which will constitute the starting-point of a campaign designed to extend still further the use of tar in road construction and road maintenance. It is confidently anticipated that all the tar producers in the country will co-operate in pressing forward the good work which the National Gas Council have thus inaugurated.

The exhibit, which has been designed by the well-known artist, Mr. Norman Wilkinson, shows a wayside inn, which has been very appropriately named "The Jolly Jack Tar," with a tar-macadam road circumscribing it in front, passing over a bridge, and going off into the background. It is altogether a delightful little scene, which will receive its meed of praise from every passer-by. The artist has admirably fallen into line with the whole scheme of an exhibition in which, as is officially pointed out, "working models and scenic effects take, in large measure, the place of stacks of raw materials." In "Canada," "Australia," and "New Zealand" there are jewels of this kind which will long remain in the mind's eye; and "The Jolly Jack Tar" will have a place among them.

The Council propose to invite surveyors, chairmen of highways committees, road constructors, and others interested, to visit the stand, and to discuss with the expert in attendance any problems of a technical nature which confront them.

It is felt that in the past the economic and practical uses of British coal tar have not received the attention they deserve; and recognizing this, it has been decided by the producers to go carefully into the question from every aspect. It is intended to conduct a thorough investigation into every phase of construction work wherein coal tar enters.

Association of Statutory Inspectors of Gas Meters.—The annual general meeting of the Association (whose President is Mr. H. N. Barrow, J.P., the Chairman of the Manchester Justices' Gas Meter Testing Committee) will be held in the new County Hall, Westminster, on Wednesday morning, June 10, when the report of the Council will be considered and the general business transacted. By permission of the London County Council, and with the assistance of the Vice-President (Mr. J. Ollis), the afternoon will be devoted to a visit to the Finsbury gas meter testing office. Members will assemble at the office in Helmet Row, Finsbury, at 2.30.

WOODALL-DUCKHAM MODELS.

A Good Display in the Chemical Hall.

Among a number of models in the Scientific Section of the Chemical Hall, in the Palace of Industry, is an interesting collection loaned by the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., to illustrate modern means that have been adopted for treating coal and some of its products.

There is an extraordinarily complete and up-to-date model of a Woodall-Duckham vertical retort installation. This shows the latest silica construction, with two-stage heating, largely by which means the Woodall-Duckham Companies have been able to increase the thermal yield per retort by approximately 50 p.ct.

There is also a model of the most recent intermittent vertical chamber system. This model, as well as that of the chamber oven, is of quite a novel type. Every detail of operation, mechanism, and machinery is indicated; and nothing could be better than this method of presentation, on a small scale, of the system.

The model of the inclined chamber oven, another system which is also handled by the Woodall-Duckham Companies, is similar in conception to the intermittent vertical chamber model. These chamber ovens are particularly applicable to large works, where dense, blocky coke is desired, and where difficult coals only are available. In fact, the chamber oven may be taken as a substitute for large-scale horizontal practice, in that labour costs are materially reduced as compared with horizontals.

Another model of great interest is that of the "T.I.C." (lead bath) complete tar distillation plant. This is to scale; and the "attendant" in charge of the plant is also to scale. The model is complete with stills, condensers, heat interchangers, furnaces, receiving bunkers, pitch bays, railway tracks, and receiving trucks.

A brickwork model shows various sections of the latest type of Becker oven, and the cross-over flues which enable the coke ovens to be built longer and higher than was previously possible. In these ovens blast furnace coke, domestic coke, or free-burning smokeless fuel can be made at will. The throughput of coal per day may be as high as 25 tons per oven.

The Carpenter centrifuge—an apparatus for drying wet coals—is exhibited in model form. The most recent plant installed in this country is reducing the moisture to 5 p.ct., has a capacity of 50 tons of coal per day, and a power consumption of less than 1 H.P. per ton of coal treated. We understand that there is a big demand on the part of the collieries for these driers.

There are a number of excellent coke sections prepared by the research branch of the Woodall-Duckham Companies, to illustrate the structure of solid smokeless fuels made in different ways. Each of the models shown by the Companies is accompanied by one or more large framed photographs of the models, on which are indicated the names of the different parts of the plants. These photographs will prove of great value to the uninitiated.

Further, the Woodall-Duckham Companies have loaned to the Chemical Section forty mounted photographs, which form a sort of picture gallery illustrating the complexity and ramifications of the gas industry. These photographs are representative of the industry in all parts of the country.

There is no hesitation in saying that a close examination of this collection of models will repay those interested in carbonization.

Gas for Wicker Furniture Making.

The claim is advanced in the columns of the "American Gas Journal" that gas-fired boilers have done more to make reed and wicker furniture popular than any other one thing. Gas heats the water in which the dowels, or round pieces of rattan, ash, birch, or other wood are soaked to make them flexible. The reed pieces are then gone over with a gas torch, which singes off the fuzz; and the next operation is to place them in high-pressure steaming ovens, gas heated, where the dowels are rendered so flexible that they can be twisted and wound in any shape desired. The use of gas not only increases the speed of production, but reduces breakage to a minimum, and entirely eliminates cracking or warping in the finished product, as the high steam pressure forces the moisture on the outside of the dowels into the cells of the wood, and thus renders it extremely flexible. Wicker furniture manufacturers say that the introduction of gas fuel in the singeing and steaming operations has enabled them to keep pace with an enormous public demand for their product.

Preparing a Tender.—The Society of Engineers have published in pamphlet form (price 3s., post free) a paper entitled "Notes on Preparing a Tender," by R. I. Money, M.Inst.C.E. This lengthy paper contains some valuable data, and will prove very useful to engineers.

GAS AND THE HOUSING PROBLEM.

The Palace of Housing and Transport.

Reference was made by the King, in his speech at the opening, to the fact that this year one of the great halls—it is the one which last year constituted the Palace of Engineering—has been devoted to exhibits illustrating those problems of housing and transport which call so urgently for solution. It will be found that the principal section of what has thus now become the Palace of Housing and Transport is devoted to a collection of model houses, built with all the latest improvements known to science. Set out in tempting array, with gardens containing flowers and shrubs, are houses of timber, houses of brick, houses of steel, houses of timber and steel, houses of steel and concrete, and houses of concrete alone.

For this Housing Section, it is safe to prophesy great and lasting popularity. It deals with a problem that is in the minds of all at the present juncture; and it deals with it in a manner that must be productive of good. It shows that houses which are a pleasure to the eye so far as the exterior is concerned, and comfortable in the interior beyond all possibility of comparison with many of the old-style houses of similar size and class, can be provided without difficulty from the material point of view, if other obstacles are removed. There is plenty of room in the Palace for the various buildings to be seen in proper perspective, which is, of course, a highly important consideration in connection with exhibits of this character. However, of the general lay-out of this part of the exhibition it is impossible to say more here. Our special interest in the section at the moment centres on the displays mentioned below.

"Century" Houses.

Occupying a prominent position in the Palace of Housing will be found a pair of "Century" houses, of the shingled type, constructed by Messrs. Henry Boot & Sons (London), Ltd., of No. 12, Grosvenor Place, S.W. Scientifically planned and executed in substantial style, these houses are provided with a living room, scullery, bath room, lobby, and the usual conveniences, on the ground floor, and three bedrooms; and the British Commercial Gas Association have been instrumental in arranging an appropriate and highly effective installation of gas apparatus. The lighting points, by means of Bland Light Syndicate fittings, have been arranged so as to demonstrate good illumination combined with efficiency and strict economy. There are one-light pendants with silk shades, and the feature of this portion of the exhibit is the fact that the illumination is arranged to correspond with the natural lighting. The pendants are fitted 2 ft. 6 in. back from the windows in the bedrooms, as this position provides the best light for a woman making her toilet.

From the fuel consumption point of view, the houses are smokeless throughout. In the scullery, there is in one case a Messrs. R. & A. Main's "Maintop," and in the other a Radiation "New World Junior" cooker. The wash coppers are respectively by Messrs. Wilsons & Mathiesons and Messrs. John Wright & Co. In the bedrooms there are built-in gas fires, with cast-metal registers complete, supplied by the Davis Gas Stove Company, Messrs. Fletcher, Russell, & Co., the Parkinson Stove Company, and Messrs. John Wright & Co.

"Solignum" wood-preserving stain is used here.

"Solignum" House.

While speaking of "Solignum," mention should be made of a charming little house in the Palace, which is occupied by Messrs. Major & Co., the proprietors of this extensively used wood preservative, and in which they draw attention to its many advantages.

A Gas-Fitted Bungalow.

An attractive bungalow has been fitted out by Messrs. Hampton & Sons, Ltd., of Pall Mall East, London, S.W.; and in this there are demonstrated up-to-date methods of hot water supply and cooking. For the former there has been installed by Messrs. Thomas Potterton, of Cavendish Works, Balham, S.W., a "Victor" No. 931 complete apparatus, so arranged as to afford an example of hot water service throughout the bungalow—supplying the bath, sink, and hand basins, and operating in conjunction with a No. 1 "Domestikatum" boiler, airing coil in the linen cupboard, and nickel-plated towel dryer in the bathroom. The No. 1 "Domestikatum" boiler forms an excellent combination with the "Victor" gas boiler, for alternative use in suburban and country residences, where access to the fuel store is easily arranged.

The cooking equipment of the bungalow is represented by a "Chef" series stand model gas cooker, by Messrs. William Sugg & Co., of Ranelagh Works, Westminster, S.W., as an example of efficient apparatus for this purpose.

Mr. John Graham Stewart, of Dunblane, Chairman of Messrs. Stewarts and Lloyds, Ltd., tube manufacturers, who died in March, aged 63 years, left personal estate in England, Scotland, and abroad of the value of £396,753.

GENERAL EXHIBITS.

"W.-D.-C." Gas-Fired Boiler Burner Equipment.

An exhibit by Messrs. Burnard in the Palace of Industry consists of a complete milk sterilizing plant, and in connection therewith is a Woodall-Duckham-Cochran gas-fired boiler, fitted with the burner equipment of British Furnaces, Ltd., whose head office and works are in Derby Road, Chesterfield.

The Cochran boiler is of an ideal design for the purpose of incorporating the principles of surface combustion, and in the "W.-D.-C." gas-fired boiler these principles are applied. The usual grate for coal firing is replaced by a bed of broken refractory material, and into this bed is delivered a correctly proportioned mixture of gas and air. Combustion is instantaneous and complete, and the bed rapidly attains a state of incandescence.

The burner consists of a heavy casting set in brickwork, and so arranged that only a minimum of surface is exposed to, and can absorb heat from, the furnace. A sufficient cross section is provided to conduct back to the outside of the furnace the heat so absorbed. In this manner, the tip or nozzle is automatically kept uniformly cooled. The burner is supplied with a correctly proportioned, and thoroughly homogeneous, mixture of gas and air through a surface combustion proportioning inspirator. These inspirators automatically maintain constant and correct proportions of gas and air in the mixture fed to the burner, and they further make it possible to control the quantity of mixture by means of a single valve. Independent means are provided for setting the air-gas ratio.

The advantages claimed for the "W.-D.-C." gas-fired boiler are: Guaranteed high efficiency (up to 90 p.ct.); perfect and flameless combustion; automatic proportioning of gas and air; back-firing and explosions eliminated; no excess air in products of combustion; no brickwork setting required; no induced draught; dry steam; minimum floor space; radiant heating; and automatic control easily applied.

"Ideal" Domestic Boilers.

In the Housing Section a good show is made of "Ideal" domestic boilers, which, it is pointed out by the makers—the National Radiator Company, Ltd., of Hull, and Nos. 439 and 441, Oxford Street, London, W.—are simple in design, yet highly efficient; 50 gallons of hot water being obtained with 9 lbs. of coke. They occupy little space when installed, and are easily connected to existing pipes, as auxiliary to, or independently of, the kitchen range boiler; and they are, of course, of great use accompanying gas cookers. Both closed and open-fire patterns are manufactured, so as to meet all requirements. The "Ideal Classic" boiler is designed for central heating systems, and enables from three to ten rooms to be warmed from a single fire, at the same time providing abundant hot water for baths and domestic use.

Asbestos for Engineers.

Bell's United Asbestos Company, Ltd., who are represented in the Palace of Transport, were the first to engage in the European asbestos trade, having been established in the year 1871. All asbestos goods sold by the Company are made at their own works; and the Company are therefore able to secure for their products a uniform standard of excellence.

"Monometer" Specialities.

Again this year there are to be seen examples of the specialities of the Monometer Manufacturing Company, Ltd. In the Palace of Transport attention is drawn to their white metal furnace for use with gas, as well as to their patent low-pressure gas die-casting machine. Those connected with the printing and allied trades who go to Wembley will doubtless take the opportunity of inspecting this exhibit, which is likely also to receive the consideration of gas men. To the white metal user the appliances present various features which deserve to be taken into account; while the gas man will regard them as useful media for securing an addition to the highly desirable "industrial load."

Pasteurizing Milk by Gas.—If you cannot obtain pasteurized milk, and if you are doubtful about the purity of the raw milk, you may pasteurize it at home on the gas cooker hotplate by the following easy methods set out in the "American Gas Journal": Take a pail deep enough to allow water placed in it to reach the neck of a quart milk bottle. Place an inverted saucer in the bottom of the pail, and set the bottle of milk on the saucer. Pour water into the pail up to the top level of the milk in the bottle. Put the pail containing the bottle and the water on the hotplate, and leave it there until the water boils. Then turn off the gas, remove the pail, and let it stand, covered, for half-an-hour. Remove the bottle of milk, and cool it quickly by letting cold water run over it. Boiling the milk for three minutes will also make it safe for infant feeding.

NEW GAS SHOWROOMS AT HULL.

Enterprise of the British Gas Light Company, Ltd.

The new showrooms of the British Gas Light Company at Hull are generally admitted to be, for beauty and completeness, in the very front rank of such contributors to the service of gas undertakings. Attestation to this is given by the series of photographs which we are enabled to publish this week through the courtesy of the Company's Engineer and Manager at Hull (Mr. Harold E. Copp).

The showrooms occupy an important corner site in the centre of the city, and have a window frontage of approximately 180 ft. There are two entrances, one in Story Street and one in Prospect Street. The main entrance hall is in Story Street, and is 45 ft. long by 15 ft. wide. On the right, as one enters, is the Showroom Manager's office, the accounts and cash sales office, and the service and complaints office, while beyond this is a model room, the idea of which is to display suitable gas apparatus for heating and lighting to suit the particular furnishings shown. To the left is seen the ground-floor showroom, the salesmen's desk (where all sales, &c., are recorded), and the seating accommodation provided for consumers. Here also is

Entrance Hall.

A Corner of the First Floor.

Combined Showroom and Rest Room.

Another Showroom with Bathroom Annexe.

shown a coke fire in operation, constructed on Prof. Boys' principle, and lighted by a gas poker burner. This has attracted considerable attention, and has stimulated the sale of coke for household use.

The display of lighting fittings on the ground-floor is also an attractive feature. The showrooms on the first-floor are beautifully arranged, and are interconnected by archways.

A pneumatic tube has been installed, connecting the cashier's office on the ground-floor with the general offices in Baker Street, situated about 380 yards distant. Cash and receipts are passed directly through the tube between these points, and the carrier only occupies about 18 seconds in transit. One of the illustrations shows the room at the top of the staircase. This is a showroom and rest-room combined, being tastefully arranged, light, and airy. The centre-well provides adequate ventilation and light.

Another photograph portrays a showroom in which are a model bath, a gas-heated towel rail, a geyser, and a "B.T.U." circulator, together with glass show-cases containing silk shades, gas brackets, and glassware. Here also are shown gas fires in suitable fireplaces, "Eye-Level" cooking ranges, &c.

A portion of the gasfittings display room and the costing office counter are depicted in a further illustration. The beauty of the arches and architectural work generally will be noted in the various photographs.

On the top floor a lecture room has been provided which will seat about 120 people, and cookery lectures are already proving themselves a great source of attraction and interest. Stock rooms and a test room have also been fitted on this floor. All floors are reached by a lift.

The Architect for the work is Mr. P. Morley Horder, F.R.I.B.A., of London.

In the handsome new building, cookery lectures and demonstrations have been revived; and the opening lecture was delivered by Mrs. Dunn on April 20. On the occasion, Mr. Copp stated that the primary object of the lectures was service to the community. The British Gas Light Company, Ltd., he said, instilled into the minds of their officials the idea that they were the servants of the public, with obligations and responsibilities to their consumers. In London, Paris, and New York—especially in the last-named city—there was an enormous increase in gas consumption for domestic purposes. One could not help feeling that in this country cookery had been neglected; and it was with the idea of securing an improvement in this direction that the lectures were being revived.

Mrs. Dunn, who has been on the staff of the British Gas Light Company for many years, is an interesting demonstrator, and there are no dull text-book references in her lectures. Her audiences (on the occasion of the first lecture, as on others) made profitable use of notebooks and pencils, and were in general agreement that a simple recipe and an ordinary gas cooker could in combination achieve delectable results in pastry making. The lectures occupy about one hour, and are held in the afternoons.

Gasfittings Display Room.

Lecture Room.

HOUSE HEATING.*

It is a truism that only the one who knows a great deal about a subject can write about it in a simple and convincing manner; and it is a wise precaution in these day , when truth is too often relegated to the back of the stage, while dramatic effect prances and pirouettes in front of the footlights, to be suspicious of "cleverness." Readers of "House Heating," however, have no need to be suspicious of this book. It is certainly the best treatise on the relative merits of coal, coke, gas, and electricity as alternative means of providing for domestic heating, cooking, and hot water requirements which we have yet encountered. The author, Dr. Margaret Fishenden, who is at present engaged upon investigations into problems of domestic heating for the Department of Scientific and Industrial Research, is well known to many readers of the "JOURNAL," on account of the valuable work which she has already accomplished; and the gas industry will be indebted to her for publishing a well-balanced book containing information on which full reliance can be placed.

The first chapter deals generally with fuels, and mention is made of the vast amount of raw coal which is still burned in our domestic grates. After reading this chapter one is impressed with the need for paying greater attention to the production of a high-temperature coke to replace much of this coal. Dr. Fishenden says that, as a domestic fuel, gas coke in this country has met with only a restricted measure of acceptance. This is due partly to its low volatile content, and partly to the amount of water which it frequently contains. Also, the "'sulphurous' smell often associated with coke fires burning below flues where the draught leaves something to be desired is another cause which has militated against its more general employment for household purposes, and which has led to the erroneous idea that coke contains more sulphur than coal."

Recent investigation into the problem of combustibility of coke—and we would refer particularly to the work of Sutcliffe and Evans—has proved that the structure of a coke has a large bearing on its combustibility, and is, indeed, the greatest influence. In view of this there seems to be a wide and almost unexplored field for the use of high-temperature coke for domestic purposes; and in thinking of this we are reminded of the stress laid by Sydney North and J. B. Garbe, in their recently published book, "Low Temperature Distillation," on the need for keeping in the forefront of low-temperature carbonization the object of producing the largest quantity of oil, and regarding the residual fuel as a secondary consideration. No doubt the Coke Competition—full details of which have appeared in the "JOURNAL"—will add to our knowledge of gas coke, and demonstrate the modifications whereby the gas industry may produce a coke suitable in all respects for domestic requirements.

Speaking of electricity as a heating agent, the author states that the low efficiency of its generation militates against its general adoption for this purpose. In the United Kingdom, an overwhelming proportion of the total electricity supply is yielded from the burning of coal; and in spite of the Final Report (1921) of the Water Power Resources Committee, Dr. Fishenden remarks that it is "very unlikely that the near future will see any considerable proportion of this potential power (water) harnessed, and for heat production electricity will probably remain relatively costly."

The development of the modern sitting-room grate and of the kitchen range, the use of gas and electricity for heating and cooking, and the development of central heating—these subjects are dealt with thoroughly. It would be an easy matter to write at length on the many points raised by reading "House Heating," for it is a book which encourages thought. Sufficient has been said, however, to indicate the value of the work; and Dr. Fishenden and Messrs. H. F. & G. Witherby are to be congratulated on the writing and production of a volume which has created a new standard in the literature of a subject of first-rate importance alike to the nation and the individual.

* "House Heating," by Margaret Fishenden, D.Sc., F.Inst.P. Published by H. F. & G. Witherby. Price 25s. net.

SCOTTISH JUNIOR GAS ASSOCIATION.

(WESTERN DISTRICT.)

MEMBERS OF COUNCIL, 1924-25.

Back Row (Left to Right): J. M'Intyre (Glasgow); W. Hogg (Glasgow); A. Shand (Falkirk); J. Hall (Provan); J. Brown (Glasgow); J. Teape (Glasgow).
Front Row: J. Murray, Hon. Secretary (Glasgow); Robert Gray, Vice-President (Hamilton); J. M'Isaac, President (Glasgow); A. Walker (Kilbarchan); and A. T. Sinclair (Greenock).

NATIONAL GAS COUNCIL.

SCOTTISH DISTRICT.

The Annual Meeting was held in the North British Station Hotel, Glasgow, on May 5—Councillor James Stewart, Convener of the Edinburgh Gas Department, in the Chair.

Annual Report.

Gas Regulation Act, 1920.—At the annual meeting in May, 1923, the proposal that municipalities in Scotland owning gas-works be advised to take early steps to adopt the Act, and apply the therm system of charge as from the commencement of the next financial year—namely, May 15, 1924, was unanimously agreed to. At this date 37 undertakings—municipal 33, statutory companies 4—have adopted the Act. The undertakings, with their declared values, are as follows:

Undertaking.	Present Declared Calorific Value.	Undertaking.	Present Declared Calorific Value.
	B.Th.U.		B.Th.U.
Municipal:		Municipal:	
Aberdeen	—	Holytown	400
Airdrie	425	Inverness	500
Alloa	440	Johnstone	420
Arbroath	450	Kirkintilloch	450
Bellshill	400	Lanark	470
Bridge of Allan	500	Larkhall	400
Cambuslang	400	Motherwell	400
Denny	550	Paisley	500
Dumbarton	425	Peebles	520
Dumfries	500	Perth	450
Dundee	450	Renfrew	450
Dunfermline	430	Troon	450
Dunoon	450	Uddingston	400
Edinburgh	500	Wishaw	400
Falkirk	430	Company:	
Glasgow	470	Busby	500
Grangemouth	500	Coatbridge	475
Greenock	410	Musselburgh	450
Hamilton	440	Stirling	475

It is learned that the experience of undertakings working under the Act has been satisfactory, and that there is not the slightest desire to revert to the old order of practice. The therm method has been favourably accepted by the public.

A deputation representing municipalities and other local authorities in England recently approached the Board of Trade suggesting that the adoption of the Act should be left to the voluntary action of the municipalities and authorities concerned. Mr. Ashley, Principal Assistant Secretary, Industries and Manufactures, Board of Trade, stated that "after two years from the passing of the Act the Board of Trade were empowered (under section 1 (5)) to make compulsory Orders; it obviously being the intention of Parliament that the new basis should ultimately be adopted throughout the whole of the gas industry. To the local authorities who had not yet applied for an Order the Board of Trade had given 2½ years' grace; but the time had come when it was necessary for the Board to decide what they were going to do to carry out what was clearly the intention of Parliament." The impression with which the deputation came away was that the Board of Trade would, sooner or later, compel every gas undertaking to come under the Act at an opportune moment for the undertaking.

The municipalities in Scotland who have not yet made application for an Order are as follows: Alva, Ardrossan, Bervie, Buckhaven and Leven, Burntisland, Campbeltown, Carnoustie, Darvel, Doune, Dunbar, Elgin, Forfar, Fraserburgh, Gourock, Helensburgh, Kilmarnock, Kilsyth, Kirkcaldy, Kirkcudbright, Kirkwall, Largs, Lockerbie, Millport, Monifieth, Newmilns, Newport, North Berwick, Peterhead, Port Glasgow, Sanquhar, Tain, and Tayport.

As regards the position of municipalities in Scotland, the Board of Trade desired to meet representatives. Accordingly a small deputation—Mr. James Campbell, of Dunfermline, President of the North British Association of Gas Managers, and Mr. J. W. Napier, of Alloa, along with Mr. Fottrell, of the National Gas Council—were received by Mr. Ashley and Mr. Honey on April 6. The discussion centred round the position of the very small undertakings. It was pointed out that in addition to the expense of providing the necessary apparatus with accommodation, and fees for gas examiners, there were incidental and practical difficulties in the cases of gas-works having a small annual output, and where there was no real staff. Also it did not appear that the small number of consumers concerned would be detrimentally affected, or that the coal carbonized—taking all the small undertakings together—was of substantial quantity, or that the small gas-works were in a financial position to introduce modern carbonizing plant with economy of coal. Mr. Ashley and Mr. Honey were satisfied with the evidence placed before them, and readily agreed that the position of the small gas-works required special consideration as regards the adoption of the Act. Mr. Ashley indicated to the deputation that the Board might agree that no steps be taken in compelling the adoption of the Act in the case of gas-works having an output of 25 millions and under but that consideration would require to be given to the subject.

Scheme for Sale of Tar and Ammoniacal Liquor to Distillers.—The scheme continues in successful operation. The monthly awards of values by the Arbiter are as follows:

		Tar. Per 100 Gallons	Liquor (4° Tw.). Per 100 Gallons.
		s. d.	s. d.
1924.	May	28 11½	3 0·625
	June	26 10½	2 9·375
	July	25 6½	2 9·375
	August	23 7½	2 9·375
	September	20 6½	2 7·75
	October	19 4½	2 7·75
	November	19 4½	2 7·75
	December	19 4½	2 7·75
1925.	January	19 11½	2 7·75
	February	21 3½	2 7·75
	March	21 11½	2 7·75

NOTE.—The above rates are at distillers' works, but railway dues from gas-works to distillers' works are paid by the gas undertaking.

Parish Council Assessment.—As the result of the statement of information sent to members, a number of gas undertakings have succeeded in obtaining an increased percentage deduction granted under section 37 of the Poor Law Act, 1845.

Government Legislation and Subsidies for the Development of Electricity.—Full information upon this subject has been sent to members, and the hope is expressed that practical attention will be given to the matter by Committees and Boards of Directors. The subject involves important questions of policy. The suggested subsidies in favour of electricity are calculated to injure materially the interests of the gas industry in general. Those responsible for the administration of individual undertakings are expected to take action in the manner suggested by the Central Executive Board in the special booklet and circular letter issued.

Mr. S. S. Ogilvie (National Gas Council) explained the action proposed to be taken in connection with the suggested Government Legislation for the development of electricity. Mr. W. E. Whyte (Lanarkshire) referred to the same question, and suggested that it would be most desirable if local authorities in Scotland were to have a conference on the subject, with a view to taking steps to safeguard the interests of gas undertakings. Mr. Whyte's suggestion was unanimously agreed to, and an early meeting will be arranged for.

British Empire Exhibition, 1925—Gas Exhibit.—The sum contributed by gas undertakings in Scotland for the 1924 exhibit was about £5000. The Committee heartily commend the attention of Committees and Directors to support the scheme, which includes, besides the actual exhibit, a wide publicity campaign in the Press. Undertakings are asked to subscribe one-half of the amount they contributed to the 1924 exhibit, or 3s. per million c.ft. of gas made.

Membership.—The number of Scottish undertakings in the membership of the National Gas Council is as follows: Companies 66 (last year 66), corporation 44 (last year 44).

The following appointments were made for 1925-26:

MANAGEMENT COMMITTEE.

Chairman.—Councillor James Stewart (Edinburgh).
Vice-Chairman.—Bailie Slorach (Hamilton).
Secretary.—Mr. J. W. Napier (Alloa).

The following twelve members: Messrs. George Braidwood (Coatbridge), James Campbell (Dunfermline), James Dickson (Dundee), T. W. Harper (Ayr), L. Hislop (Cowdenbeath), Bailie Hunter (Perth), John Lang (Alexandria), George Keillor (Greenock), Samuel Milne (Aberdeen), J. W. M'Lusky (Glasgow), John M. Smith (Stirling), and W. E. Whyte (Lanarkshire).

Representatives on the Central Executive Board, with year of retiral.—Bailie Slorach (1926), Mr. J. W. Napier (1927), Mr. L. Hislop (1928), and Councillor James Stewart (1929).

Memorial to the late Lord Moulton.—A scheme has been adopted by the friends and admirers of the late Lord Moulton for the erection of a permanent memorial to his great achievements in the legal and scientific spheres, and, in particular, his invaluable services to his country in the war. The scheme comprises the conversion of the main schoolroom of the Kingswood School, Bath, into a Lord Moulton Memorial Hall.

The "Electrician" Annual Tables of Electricity Undertakings.—Messrs. Benn Brothers, Ltd., 8, Bouverie Street, E.C. 4, have published the Annual Tables of Electricity Undertakings for 1925. The Tables have been thoroughly revised, and further useful details have been added. Particulars of over a hundred additional undertakings in Great Britain, Europe, and the Colonies and countries abroad appear, while complete lists of the smaller concerns in Yugo-Slavia and Roumania are given for the first time. Altogether over 2000 undertakings are dealt with, and the new edition has been expanded by twenty pages. The price of the work is 10s. net, postage 6d. extra.

ROAD TAR EXHIBIT

OF THE NATIONAL GAS COUNCIL AT WEMBLEY.

[*Photo. Campbell-Gray.*

(*For description, see p.* 460.)

MIDLAND ASSOCIATION AT OXFORD.

In concluding his Presidential Address to the Midland Association of Gas Engineers and Managers in March, Mr. W. E. Caton, A.M.I.Mech.E., the General Manager and Engineer of the Oxford Gas Light and Coke Company, extended an invitation, on behalf of his Directors, to the members to visit their beautiful city for the summer meeting. Thus Thursday, May 7 (the date fixed), was a day which will long be remembered with pleasure by a large number of members and friends.

AT THE GAS-WORKS.

The morning was spent at the gas-works, where the visitors were welcomed by the Chairman of the Company (Alderman F. W. Ansell, J.P.), the Vice-Chairman (Mr. Walter Turrill), Alderman Dr. G. Claridge Druce, and Mr. R. C. Downing (Directors), and Mr. Caton, who, with Mr. H. A. Coombs (Assistant Engineer and Works Superintendent) and Mr. S. Colebourne (Chemist) showed them round. In his address, Mr. Caton had prepared the members for seeing a good deal of work in progress, but the extent of it proved a surprise to many of them. The reason for the entirely new unit, from retort house to meter house, which is being put down, is to be found in the fact that, when Mr. Caton was appointed General Manager and Engineer in 1916, the consumption amounted to only 100 million c.ft. By 1918 it had increased to 433 millions; and since then the growth has been still more rapid—the figure for 1924 reaching 723 million c.ft. Naturally, this rapid increase in output, due mainly to cooking and heating, severely tried the productive capacity of the existing works; and so a completely new works was decided on, to be erected on a site adjacent to the old site, to be used as an additional manufacturing station—not in substitution for the present one. It may be mentioned here that prior to the war the price of gas was 2s. 6d. per 1000 c.ft. to ordinary consumers within the city, and 3s. outside; while since July 1, 1923, the charge has been 8⅝d. per therm in the city, and 9½d. outside—or 3s. 2·64d. and 3s. 8·16d. per 1000 c.ft. respectively.

The works are located on the south-west side of the city, and occupy an area of 20 acres. They are situated on both banks of the River Thames, which divides the new manufacturing station in course of erection from the present works. The Company have two sidings from the Great Western Railway into the works. The one serving the present works passes over the River Thames, and is carried by a girder bridge, the property of the Gas Company, and thence by a viaduct into the retort house; that serving the new works goes direct into the works.

Existing Works.

Coal trucks are shunted by the Company's own locomotive along elevated sidings, on both sides of the retort house, where they are unloaded by hand into hoppers, from which the coal is fed into the breakers and elevators. The elevator on the discharging side delivers on to a band conveyor, which takes the coal across the retort bench into an overhead hopper on the charging side.

The carbonizing plant consists of two benches of ten and thirteen horizontal retort settings with Klönne regenerators; each bed containing eight retorts 21 in. by 15 in. by 20 ft. long. The safe working capacity of this plant is 2½ million c.ft. per day, with best selected coal or washed nuts. The charging and discharging are carried out by separate machines of the De Brouwer type, operated by electricity. For three years Mr. Caton has been getting over 70 therms per ton of coal.

The coke, on being discharged from the retorts, falls through openings in the stage floor into bogies beneath, where it is quenched. The bogies are drawn by means of a wire-rope haulage system up an inclined track outside the retort house and along an elevated gantry, where the coke is tipped on the main storage heap or into a hopper for feeding the coke elevator. The haulage system is driven by a 25 h.p. motor, which is operated by a series of push-button controls fitted at intervals alongside the track. The hopper fed by the coke-haulage system discharges into an elevator, which can be used either for loading direct into railway wagons or for discharging through a breaker and rotary screen, where the coke is graded and falls into bins. The whole plant is driven by one 11 h.p. electric motor.

The power house contains two 15 kw. and one 25 kw. generators, all manufactured by the Lancashire Dynamo and Motor Company, Ltd., direct driven by Crossley gas engines of 25 and 40 h.p. respectively. D.C. current (220 volts) is used for driving the stoking machinery, coke haulage gear and elevator, and screening plant.

Other plant includes a horizontal atmospheric condenser and a Clapham water-tube condenser. There are two tower scrubbers, 60 ft. high by 10 ft. diameter—one fitted with a Livesey tar extractor at the bottom; and a Walker purifying machine, which is similarly fitted with a Livesey tar extractor.

The dry purification is practically all done with a set of four purifiers, 40 ft. by 30 ft. by 5 ft. deep, with water lutes, erected by Messrs. C. & W. Walker. There is a second set of three purifiers, 25 ft. by 25 ft. by 5 ft., with water lutes, which can be worked in parallel with the main set; but, owing to difficulty in handling, these have not been worked for some years. There are also two luteless catch boxes, 40 ft. by 40 ft. by 6 ft. deep, by Messrs. C. & W. Walker.

The Parkinson station meter is of a capacity of 150,000 c.ft. per hour. There are three gasholders (besides the water gas relief holder); the capacities being ½ million, 1 million, and 2 million c.ft. respectively. The last-mentioned was recently constructed by Messrs. C. & W. Walker, and brought into commission in September last. Three 18-in. Parkinson station governors supply separate districts, but the districts are ultimately connected up.

There is one carburetted and one blue water gas plant, of Messrs. Davison & Partner's manufacture; the nominal capacities being 600,000 and 500,000 c.ft. per day respectively. There are a water-tube condenser and two scrubbers common to both sets. The unpurified water gas is sent into a relief holder having a capacity of 300,000 c.ft.; and from the holder it is drawn as required into the coal gas mains at the inlet to the exhausters after first passing through a rotary meter.

The ashes from the retort house and the water gas plant are taken to a Type B. 1 "Columbus" separator, which produces coke 43 p.ct., clinker 25 p.ct., and fine ashes 32 p.ct.

Works Under Construction.

The site of the new works is subject to flood, and consequently the ground level is to be raised about 4 ft. The new retort house will be a steel-framed building filled in with concrete block work. The first bench of retorts will consist of eight beds of Klönne settings of 8 section retorts 24 in. by 17 in. by 22 ft. long. The lay-out of the works is arranged so that the house can be extended for two more similar benches.

The coal trucks will be emptied by means of a rotary tippler into a hopper outside the retort house, where the coal will be broken and elevated into the retort house. There it will be discharged on to a push-plate conveyor running over continuous coal hoppers, a 30-ton hopper being erected opposite each bed. The stoking machinery will consist of a De Brouwer charging machine and separate discharging machine on one side, with an additional discharging machine on the opposite side of the house. The latter machine is for feeding the producers, which are placed on the charging side. The object of this is to keep the furnaces on the opposite side to the coke handling plant, which will be on the same system as in the old works. The coke will be discharged through openings in the stage floor into trucks, where it will be quenched, thence running out of the retort house to an elevated gantry—the trucks being operated by an electric rope haulage system.

Water-tube condensers only will be employed. Two sets of exhausters will be installed, each set consisting of a horizontal steam engine coupled to an 80,000 c.ft. per hour exhauster, with provision for fixing a 100,000 c.ft. per hour exhauster on to each engine. Two Lancashire boilers, 30 ft. by 8 ft. 6 in. diameter, will be fixed at first, the boiler house being large enough to accommodate four boilers eventually. Two 100 kw. steam-driven sets will be installed, each consisting of a vertical compound steam engine direct coupled to a dynamo. One Livesey washer and one rotary scrubber will be provided to begin with.

The first section of the purifying plant will consist of five purifiers 35 ft. by 30 ft. by 6 ft. deep. These will be arranged on the ground level in a single row, with a revivifying shed running along either side. Owing to the proximity of the river and the city water-works, the main tar and liquor tanks are to be constructed of cast iron, and erected above the revivifying floors at either side of the purifiers. The size of each tank will be 166 ft. 6 in. long by 26 ft. 6 in. wide by 6 ft. 6 in. deep.

Special interest was taken in the concrete block making installation; the product being utilized for the new buildings. The composition of these blocks is cement 1, sand 2, and ashes 2; four men being engaged in preparing the material and making the blocks, a large proportion of which are moulded in a Winget machine. The total number made daily is about 250.

The makers of the plant erected and ordered up to the present time are:

Concrete blocks	Oxford Gas Light and Coke Company.
Foundations, retort settings, and block-work	Messrs. Thos. Vale & Sons.
Railway weighbridge	Messrs. H. Pooley & Sons.
Tippler, elevator, and conveyor	West's Gas Improvement Company.
Steel-framed retort house, buckstays, steel hoppers, stage floor, and stoking machinery	Messrs. W. J. Jenkins & Co.
Mouthpieces, ascension pipes, hydraulic mains, foul mains, &c.	Messrs. Westwood & Wrights.
Steel-framed pump house, &c.	Messrs. Westwood & Wrights.
Condenser	Messrs. C. & W. Walker.
Livesey washer	Messrs. C. & W. Walker.
Rotary scrubber	Whessoe Foundry and Engineering Company.
Exhausters	Bryan Donkin Company.
Generating sets	Messrs. Belliss & Morcom and the Lancashire Dynamo & Motor Company.
Purifiers and connections, purifying and revivifying houses, with overhead tar and liquor tanks	Messrs. C. & W. Walker.
Station meter and retort house governor	Messrs. W. Parkinson & Co.

There is a block of offices at the existing works, comprising e Engineer and General Manager's Office, Assistant Engineer d District Superintendent's Office, Works Office, and the ot Meter Department Offices.

GENERAL.

Excellent showrooms, opposite Christ Church College, were ened in February, 1921, and have proved a very great quisition to the Company. All the gas lamps in the district supply, numbering 1537, are of the inverted superheated uster type, of Messrs. William Sugg & Co.'s manufacture; id each lamp is controlled by a Gunning clockwork controller. hese controllers have been in operation since 1907. The de-ared calorific value of the gas is 460 B.Th.U., and that pplied averages 470 to 480 B.Th.U.

HOSPITALITY.

After the inspection, a party numbering about eighty sat wn to luncheon in the Assembly Room at the Town Hall, by vitation of the Chairman and Directors of the Oxford Gas ompany. Alderman Ansell was in the chair, and he was sup-rted by the Mayor (Mr. Amos J. George), the Deputy Mayor, e Sheriff, and members of the Town Council and the Univer-ty. There were also present Mr. J. Ferguson Bell (President the Institution of Gas Engineers), Mr. W. H. Johns (Presi-ent of the Wales and Monmouthshire District Institution of as Engineers and Managers), and Mr. H. C. Smith (Hon. ecretary of the Southern Association of Gas Engineers and lanagers). After the honouring of the Loyal Toast,

Mr. HUBERT POOLEY submitted "The City of Oxford." He said e found that Oxford was first mentioned in history when King dward the Elder recovered it from the Danes in 912; and right rough those long centuries since then the city had been one of the ief centres of interest and enlightenment. Organized study, they ere told, began in Oxford about three centuries later than the year e had just named. The oldest college endowment was that of niversity College, which dated from about 1249. One was reminded at such famous men as Bacon, Wycliffe, Wolsey, Tyndale, Raleigh, lake, Pitt, and a host of others, were all connected with Oxford—ot to forget Sir Thomas Bodley, whose name was borne by that onderful library—one of the city's proudest possessions. He felt retty sure that Oxford's most important industrial effort had been ie University Press, which, as the Clarendon Press, was founded bout 1672, and had flourished under the wing of the great University ver since. One was, perhaps, tempted to criticize the authorities f that age for allowing the art of printing to advance in Europe for century-and-a-quarter before founding the press which was now orld famous; but, if one had any such uncharitable thought, one as filled with admiration for the wisdom of all the generations of Oxford men, who had surrounded her students with the beauty of her ublic places. There was a remarkable calm and majesty about he city. "Time will only permit me," he went on, "to hint at the igh hope we all have in Oxford, that the rising and future genera-ions which pass through your hands may uphold the traditions you ave already earned in that knowledge and understanding, integrity, nd high honour for which the best Oxford-trained men have been enowned." So far as the Association were concerned, Oxford for nany years meant to them Mr. Eldridge. The city was well served by im in the days that were past; and in their President he was sure he Company had already found a worthy successor.

The MAYOR said nothing could have done more to make his task f replying easy than the genial terms in which the toast had been proposed. The citizens had always felt that they had every reason to e proud of the history of Oxford. They welcomed the Association in he heartiest manner possible, and hoped they would carry away nemories which they would long cherish.

Mr. J. FERGUSON BELL, proposing "The Oxford Gas Light and Coke Company," said they had that morning inspected the large ex-ensions now in progress at the gas-works, which demonstrated the perspicacity of the Directors and the ability of their capable Engineer. Any engineering construction in Oxford had to satisfy some very critical eyes. It was one of the most beautiful of English cities, and any building, therefore, would be expected to reach a high level in appearance. But there was no reason at all why modern engineering construction should be ugly. He ventured to assert that the additions to the Oxford Gas-Works fully complied with the requirements, and when completed would be a credit to the city as well as worthy of a progressive Company. The Oxford Gas Company were very old estab-lished, having obtained their first Act of Parliament as far back as 1818. Like the many famous colleges for which the beauteous city was renowned, the reputation of the Company was not diminished by age, but continued to advance. The new works indicated the rapid progress in the use of town gas in the city. This was exactly what one would expect in a place like Oxford. The citizens must desire that every precaution be taken to preserve the gems of architectural beauty which not only adorned the city, but were of priceless value as a national asset. The use of raw coal for domestic and trade pur-poses should be discontinued, as it meant a smoky atmosphere, pol-luted with soot and sulphurous products, which were not only in-jurious to health but destructive to buildings. It was no wonder, then, that the citizens, who were so justly proud of their colleges, were using gaseous fuel in increasing quantities; and they happily pos-sessed a progressive Company able and willing to provide this on most reasonable terms. The pre-war charge for gas in Oxford was 2s. 6d. per 1000 c.ft. within the city and 3s. without; and the price to-day was only 3s. 2½d. in the city, which, considering the geographi-cal position of Oxford in respect of coal supplies, was an abnormally low figure, and indicated that the undertaking must be ably managed. They all knew the purchasing power of a sovereign was not more than 12s. to-day; so on this basis the post-war charge for gas in Oxford should be 4s. 2d. per 1000 c.ft., whereas it was only 3s. 2½d. The Directors and their very able Engineer and General Manager, Mr. Caton, were entitled to be proud of this low price; and he congratu-lated them—as well as the citizens of Oxford—upon being able to obtain town gas upon such satisfactory terms. He desired to express the members' appreciation of everything that had been done for them that day. ["Hear, hear."]

The CHAIRMAN replied that when an industry was served by gentle-men possessing the qualifications of those he saw around him, neither Directors nor shareholders would have any cause to complain. There was no fear of the powers given to gas companies by Act of Parlia-ment being exercised otherwise than in the best interests of everybody.

Dr. CLARIDGE DRUCE proposed "The Midland Association of Gas Engineers and Managers," to whom, he said, a most cordial wel-come was extended by the Gas Company. The Directors regarded such gatherings as helpful to themselves and to everyone concerned. In making Mr. Caton their President, they had honoured the Com-pany he served, as well as him.

Mr. CATON, in rising to respond, tendered the warmest thanks of the Association to the Chairman and Directors of the Company for their kind hospitality, which he took as a personal compliment and honour to himself. They had all along displayed the greatest enthusiasm with regard to his Presidency of the Association.

Mr. JAMES PATERSON submitted "Kindred Associations," remark-ing that it was a matter of the greatest satisfaction to them all that this year both the President of the Institution of Gas Engineers and the President of their Association should be men from the Midlands. The President of the Wales and Monmouthshire Institution (Mr. Johns) was also at one time a member of the Midland Association.

Mr. W. H. JOHNS, in response, said Mr. Caton was one of his oldest friends in the gas industry, and he was proud to see him in the position he occupied that day. He congratulated the Board and their Engineer on the splendid lay-out of the new plant, and felt posi-tive that the very best results could be expected from it. Care and forethought were evident in all directions. ["Hear, hear."] Mr. Caton for many years faithfully served Mr. Ferguson Bell; and it was very gratifying to find Mr. Bell present to support him.

The DEPUTY-MAYOR proposed "The University of Oxford," which was responded to by the Rev. G. CRONSHAW (Bursar of Queen's College).

Luncheon was succeeded by a short business meeting in the Council Chamber, at which one or two formal announcements were made.

A delightful afternoon followed, visits being made to a num-ber of the principal Colleges, under the able guidance of Dr. Druce, Mr. James Eldridge, and Mr. Harry Paintin—thanks to whom were voiced by Mr. Bell. Tea with the President and Mrs. Caton (for which they were heartily thanked on the pro-position of the Vice-President, Mr. F. C. Briggs, seconded by Mr. P. N. Langford) ended a thoroughly enjoyable day.

INTERNATIONAL COMMISSION ON ILLUMINATION

(*Concluded from Vol. 169, p. 606.*)

The Plenary Meeting of the Sixth Session of the Commission was held on the morning of the last day of the meeting, at Geneva—Dr. HYDE, the President, occupying the Chair.

The GENERAL SECRETARY (Mr. J. W. T. Walsh) read various messages of goodwill which had been received from the Presi-dent of the Canton of Geneva, the Institution of Gas Engi-neers, the Belgian Association of Gas Engineers (who intend to apply for representation on the Commission), the Société Technique de l'Industrie du Gaz en France, Snr. Artigas, of Madrid, Sig. Bordoni (Italy), and M. Rouland, of Paris.

The whole morning was devoted to the consideration and adoption of various resolutions resulting from the work done at the technical meetings, to the election of officers, and to the submission of the triennial budget of expenditure.

The report of the National Illumination Committee of Great Britain will be published next week.

The following were elected as officers for the next meeting, which it was decided should be held in the United States of America, in 1927, preferably in the autumn:

President.—Dr. E. P. Hyde (re-elected).

Vice-Presidents.—Sig. Semenza (Italy), M. Rouland (France), and Col. Edgcumbe (Great Britain).

Hon. Secretary and Treasurer.—Mr. C. C. Paterson.

General Secretary.—Mr. J. W. T. Walsh.

After expressions of thanks to Sir Joseph Petaval, Director of the National Physical Laboratory, for his valued co-operation, the Treasurer's recommendations were adopted.

A hearty vote of thanks was passed to the Swiss National Committee for their generous and helpful entertainment of the Commission during the meeting at Geneva, and for the ex-ceedingly efficient arrangements which they had made for the accommodation and business of the Commission. Appreciative reference was also made to the assistance received from the State Council of the Canton of Geneva, and to the League of Nations for the provision of two excellent French and English interpreters.

SOCIAL AMENITIES.

It only remains to refer to the hospitable arrangements made by the Genevese town authorities, and other hosts, for the social entertainment of the delegates who attended the meeting.

On the Tuesday evening a dinner was given by the Admini-strative Council of Geneva, at a restaurant on the banks of

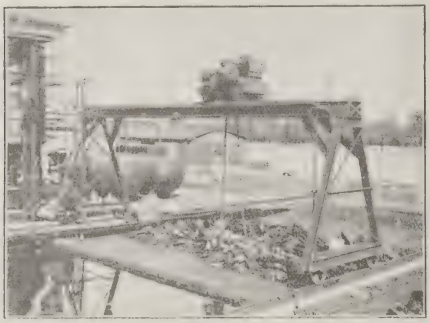
the lake—Belle Rive. The Swiss National Committee gave a dinner at the Hôtel des Bergues the next evening. M. A. Filliol, Director of the Electrical Service of Geneva, was President of this Committee, and M. F. Largiader acted as Secretary. Both gentlemen were indefatigable in attending to the comfort of all.

Thursday afternoon was occupied by a visit to the Labour Bureau of the League of Nations and to the Office of the League of Nations itself—Hôtel des Nations. At both places the members were invited to ask questions on the constitution, operation, and utility of these international organizations. Much interesting and useful information was communicated; and the thanks of the Commission for the courtesy extended were suitably expressed by Dr. Hyde, the President. On the evening of Thursday another enjoyable reunion took place, consisting of a dinner given by the Commission to their Genevese hosts and to other guests. It was held at the Parc des Eaux-Vines, delightfully situated near the lake.

PITCH GETTING AND LOADING.

The Woodall-Duckham Vertical Retort and Oven Construction Company have recently acquired a licence to sell a novel installation for getting and loading pitch from bays, which considerably reduces the cost of operation, enables the work to be carried out in much quicker time, and avoids the necessity for having men working in the pitch bay for long periods, and running the risk of becoming infected with those diseases generally associated with this operation.

Briefly, the process consists of laying a chain in serpentine fashion in an empty pitch bay, and connecting one end of the chain to a crab operated by a motor carried on a trolley travelling on an overhead support running the width of the pitch bay, as shown in the accompanying illustration. When required, the



support for the trolley can be moved along the bay by means of hand-operated gears. After the chain has been laid, pitch is run into the bay to a depth of approximately 20 in., and is then allowed to set, after which another chain is laid on the cold pitch, and a similar depth of pitch is again run in, and allowed to set. The numbers of layers of pitch which can be laid in this fashion is governed by the depth of the bay. When it is desired to "get" the pitch, the crab on the trolley is put into operation, and starts hauling on the uppermost chain. The crab and motor travel to the point of attack automatically, gradually drawing-up the chain from the bay, and in so doing breaking-up the pitch into pieces, the maximum size of which is roughly 20 in. square.

The method employed for pulling the chain is such that the whole operation can be carried out, at the rate of 4 ft. of chain per minute, by a motor of approximately 5 B.H.P.

The pitch, which should be run into the bay at a temperature of not more than 250° C., has no effect on the links of the chain; and practically no dust is produced during the operation of breaking.

After the material has been broken-up, it is conveyed into trucks by means of a small movable loading conveyor. By this system it is possible to break-up pitch at 1·5d. per ton, and load into railway wagons alongside the bay at 3d. per ton.

One of these installations has been in operation at Kiel for two years, and it can be safely stated that the maintenance cost is extremely small.

Gas Mantles Committee.—The Committee appointed by the President of the Board of Trade to inquire into, and report upon, an application made by the Incandescent Mantle Manufacturers' Association for the imposition of a duty upon gas mantles, propose to hold public sittings for the taking of evidence at 10.15 a.m. on Friday, May 22, and Monday, May 25, at the Board of Trade, Great George Street, London, S.W.

WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.

The Third Annual Meeting was held at Newport on Saturday, May 2.

Mr. B. J. Bell (President) said that they were honoured by the presence of Mr. J. H. Canning, of Newport.

Mr. J. H. Canning, on behalf of the Chairman and Directors of the Newport (Mon.) Gas Company, welcomed the Association. He congratulated the Association upon the well-deserved success achieved, which was largely due to the enthusiastic way in which the members had taken up the work. Mr. Canning referred to the intensified electrical competition with which the gas industry now had to cope. At Newport they were displacing many electric cookers and heating appliances. He counselled them all, whatever their position in the industry, to use their best endeavours to keep in close touch with the public, and strive to give consumers the facts. If they were to do this, however, they must be able to speak of the merits of gas. He encouraged the members to cultivate the art of public speaking.

Mr. Bell moved a vote of thanks to the Chairman and Directors of the Newport Gas Company for their hospitality and kindness in affording facilities for their meeting, and also to Mr. J. H. Canning for his presence and encouragement.

Mr. R. G. Shute (Cardiff) seconded the motion, which was carried with acclamation.

Statement of Accounts.

In the absence of Mr. R. J. Auckland, the Hon. Treasurer, the statement of accounts for the past year was presented by Mr. Osborne (Cardiff). The total income amounted to £38 18s. 5d., and the expenditure to £30 9s. 11d., leaving a balance in hand of £8 8s. 6d.

The President said that the position disclosed was eminently satisfactory; and he took the opportunity of informing the meeting of the generosity of Mr. T. Noall (Cardiff), one of their members, who had contributed £2 2s. to their funds.

Following discussion, the statement of accounts was passed on the proposition of Mr. Shute, seconded by Mr. C. S. Bateman (Cardiff).

The report of the Council was read by the Secretary, Mr. W. E. Crowley.

Mr. J. Hislop moved, and Mr. T. A. Canning seconded, that the report be accepted, and an expression of the thanks of the Association to the Council and Secretary be recorded.

The President supported, paying a warm tribute to the work of the Secretary.

The motion was carried with acclamation.

The Secretary announced that he had received a letter from Mr. R. J. Auckland, resigning the office of Hon. Treasurer to the Association.

It was resolved, on the proposition of Mr. Hislop, seconded by Mr. C. S. Thane (Newport), that Mr. Auckland's resignation be accepted, and that he be thanked for his services as Hon. Treasurer, and for the invaluable support he had at all times given to the Association.

On the proposition of Mr. R. J. Williams (Abertillery), seconded by Mr. H. G. Brown (Cardiff), it was unanimously decided to ask Mr. R. J. Auckland to accept election as the first Honorary Member of the Association.

The President declared the result of the election of officers and Council for the following session:

President.—Mr. J. Wood, Pentre.
Senior Vice-President.—Mr. D. M. John, Aberdare.
Junior Vice-President.—Mr. C. S. Bateman, Cardiff.
Hon. Treasurer.—Mr. A. H. Shepperd, Swansea.
Hon. Secretary.—Mr. W. E. Crowley, Newport.
Auditors.—Mr. R. E. Foster, Cardiff, and Mr. T. Noall, Cardiff.
Members of Council.—Messrs. T. Hunt, Porth; C. H. Collins, Swansea; G. H. G. Hughes, Chepstow; and V. T. Blake, Cardiff.

Mr. T. A. Canning (Newport) proposed that the rules of the Association be amended to permit of an associate membership class being formed.

Mr. G. H. G. Hughes (Chepstow) seconded the motion, which was supported by Mr. Collins (Swansea) and Mr. T. Smith (Cardiff).

The proposition was carried unanimously.

Mr. T. A. Canning moved that the Association extend a sincere vote of condolence to the relatives of the late Mr. H. E. Jones. The work of the late Mr. Jones was too well known to need reiteration, but it might be pointed out that at one time he had been engaged at Pontypridd.

The vote was seconded by Mr. Bateman, and accorded by the members standing in silent respect.

Votes of thanks to the President and to the Scrutineers and Auditors concluded the meeting.

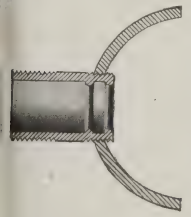
THE "DU-EX" NIPPLE.

It is now a number of years since steel tubes first began to set fresh problems in mainlaying. One of these problems concerned the connecting of services to a main whose shell was of much less thickness than had formerly been negotiated with screw threads, but was, at the same time, of far greater strength. It was necessary to provide some device that would make use of the strength and also provide soundness.

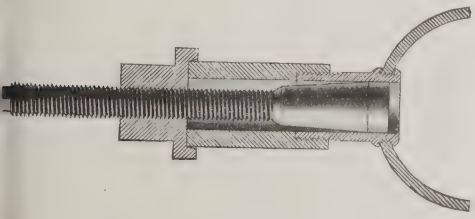
The inventor of the expansion nipple perceived that, by expanding or riveting a nipple against the interior of the wall of the main, strength could be obtained to pull against, and this strength could be utilized for the pressing down of an exterior saddle joint with gutta percha ring—the latter to be depended upon for soundness.

A great deal of experiment was made to determine the exact shape of this saddle joint, and tests were carried out under drastic conditions. The sizes chosen for the tests as an extreme proposition were a 1 in. nipple screwed into a 3 in. main, a ratio of 1 to 3, though 1 in 4 is recommended in general practice. The expansion nipple and saddle joint, which have held the field for so many years, passed this initial test; and, provided the nipple has been screwed right home and expanded truly within the main, the joint has been so satisfactory as to add not a little to the utility of steel mains.

True progress, especially in these days when economy is vital to industry, should move in the direction of simplicity. Now the "Du-Ex" nipple has been devised to supersede the expansion nipple. By an ingenious adaptation of the original idea, the expansion nipple is to be rendered independent of its adjunct, the saddle joint. A second expansion has been added, without increase of cost for the nipple, and making no difference in the method of working, or the tools employed; but it does away with the saddle and packing ring. The "Du-Ex" nipple gives soundness as well as strength; it has passed the drastic test of a 1 in. nipple in a 3 in. main. A glance at the illustrations will show how the nipple is formed—with two internal ledges, the one for expansion inside the main, and the other outside. Thus the expansion is now effected evenly against the wall of the main, and the threads of nipple and main, though few in number, are so evenly pressed together that no fluid can escape. Here again, as with the single expansion nipple, it is, of course, essential that the nipple shall be screwed right home. The space between the two ledges by which the nipple is expanded is commensurate with the thickness of the wall of the main, or, rather, with the thickness *plus* the curve, for small mains with less gauge and more curve take the same nipple as the larger mains with thicker gauge and less curve. Here is simplicity exemplified, for, without the saddle joint, it is no longer necessary to specify the size of main, and the "Du-Ex" nipple can be stocked merely in accordance with the diameter of services.



Before Expansion.



Expanded.

In case there should be any reader not familiar with the working of the expansion-nipple, we reproduce the routine for the "Du-Ex," as laid down by the makers:

The main is drilled and tapped as usual (with special combination drill-taps provided) and the "Du-Ex" nipple is screwed-in, with the mandrel sleeve and nut attached. Then, by means of a ratchet spanner, the nut is turned, and the mandrel thereby drawn out until it has passed both ledges. It then comes away free, leaving the nipple firmly gripped in the main—so firmly indeed that it cannot be unscrewed by any ordinary means, or wrenched out by any conceivable accident.

In service laying it remains to give the exterior of the "Du-Ex" connection a similar coating and wrapping to that which is usually applied to the main joints. Engineers who desire to make assurance doubly sure, and do not mind the extra expense and the inconvenience of keeping stock, can yet add the saddle and packing ring to the "Du-Ex" nipple. It is a remarkable convenience that the introduction of this improvement makes no disturbance to existing tools or methods.

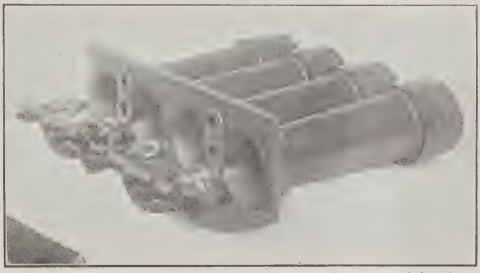
For spun cast-iron pipes the thickness of which is greater than that of steel, but less than cast-iron, the "Du-Ex" nipple is made with a greater space between the two expansion ledges.

The patent for the "Du-Ex" nipple is in the names of T. W. Meakin, B. R. Parkinson, and the firm of J. Stone & Co., Ltd., of Deptford (the latter are also the sole manufacturers).

WILTON'S PATENT ECONOMY JETS FOR FORCED-DRAUGHT FURNACES.

Users of steam-jet operated forced-draught furnaces burning low-grade fuels will be further interested in the latest improvements by the Chemical Engineering & Wilton's Patent Furnace Company, Ltd., in the furnaces manufactured and sold by them. With this improvement, besides being able to burn the cheapest and lowest-grade fuels without affecting the efficiency and evaporative power of the boiler, they will be able to effect further saving of fuel by fitting the new design of blowing apparatus to their existing grates.

After numerous and careful experiments carried-out along strictly scientific lines and under actual working conditions, it was found that the amount of steam used to create the blast on various kinds of steam-jet operated grates was excessive, especially when burning the lower grades of fuel.

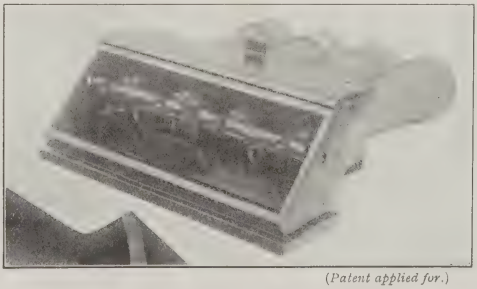


(*Patent applied for.*)

Blower with Bridge and New Type Jets
(Silencing box removed).

The blowing apparatus has been redesigned, and can be fitted to almost any furnace of this type, while the new jets, which embody a slight but important modification of the venturi principle, have been found to reduce to the extent of 55 p.ct. the amount of steam required to produce the maximum blast. While the efficiency has been increased by this amount, the new blowers provide exactly the same amount of air throughout the furnace grate as hitherto, at equal static pressure over the whole grate area.

The saving which can be effected is remarkable, and the engineer using this type of grate who requires to reduce his fuel costs to the minimum should not hesitate to adopt these new principles in his existing Wilton furnaces. It was found



(*Patent applied for.*)

Blower Jets and Silencing Box
(Cover removed).

that on a Lancashire boiler evaporating 3246 lbs. of water per hour, burning coke breeze of a calorific value of 10,000 B.Th.U. per lb., a saving of 6 cwt. of fuel per day was possible, representing, when working 7 days a week and 24 hours each day, a saving of 42 cwt. per week. The furnaces are covered by patents and protected designs. It may be added that the latest pamphlet regarding this is of great interest, and the makers will be pleased to furnish copies to all who care to apply.

SAMPLING OF COAL.

[Abstract of a Paper by F. H. Walker, B.Sc., A.I.C., of the South Metropolitan Gas Company, before the Newcastle Section of the Society of Chemical Industry.]

Accuracy in sampling depends mainly on :

1. The collection of a sample evenly from all parts of the bulk to be sampled.
2. The ratio of the weight of the sample to the weight of the bulk to be sampled.
3. The ratio of the largest pieces of impurity in the sample to the weight of the sample collected.
4. The fineness to which the sample is crushed for each stage in its reduction.
5. Proper mixing before each reduction.

It is very necessary, when collecting samples from trucks, to take portions from the bottom and middle parts of the load, and not only from the top. In a certain case a truck was found to contain coal at the bottom with an ash content of 8 p.ct. more than that at the top.

Sampling Cargoes of Gas Coal from the Northumberland and Durham Coalfields.

The sampling and inspection staff consists of six samplers and four youths, under the supervision of an inspector. Covered accommodation is available on the ships, with an iron floor on which samples may be crushed without fear of contamination. This cabin is not used for any other purpose. The samplers aim at collecting four or more "gross samples," each approximately 1000 lbs. in weight, from each cargo.

A gross sample is collected by plunging a special sampling ladle into the stream of coal as it pours from the shoot into the ship's hold. Quantities of 10 to 20 lbs. are collected by the sampler in this manner at regular intervals during the whole period of loading each of the four hatches, or as long as time permits. The collected coal is carried to the sampling cabin in ordinary buckets.

When the collection is completed, the gross sample is divided into two parts—over ½ in., and less than ½ in. size by screening, and the weight of each part ascertained. The pieces of dirt are then picked out by hand from the larger size, weighed, and well pulverized by means of an iron punner. This dirt represents what ought to be removed on the picking belts at the collieries under ideal conditions. The large coal is crushed to 1 in. size or less.

The crushed dirt is then mixed with the "small" coal by repeated coning, and this mixture in turn is mixed with the crushed "large" coal. This method of crushing and mixing is adopted to render more certain the even distribution of the dirt in the sample. Great importance is attached to the proper mixing of the gross sample before the first reduction. The difficulty of carrying out this operation by hand labour renders undesirable the collection of gross samples of more than 1000 to 1200 lbs. The first reduction of the gross sample to 500 lbs. is made by the long pile and alternate shovel methods. This system of reduction is more convenient than the cone method in a limited floor space; it possesses no other advantage.

The subsequent crushing and reduction are carried out in a similar manner to that described in Bulletin No. 116 of the U.S. Bureau of Mines, with the exception that all mixing is carried out on the iron floor, and not on a blanket. An iron sample cutter is used to facilitate the divisions of cones into four parts.

The samplers are instructed to crush the coal and impurities at each stage in accordance with the sizes in the following table, as judged by the eye :

Weight of Sample to be Divided.	Approximate Largest Size of Coal and Dirt Allowable before Division.
1000 lbs.	1 in.
500 ,,	½ ,,
250 ,,	¼ ,,
125 ,,	⅛ ,,
60 ,,	¼ ,,
30 ,,	1/16 ,,

After the final reduction to about 7 lbs., the whole of the remainder is transferred to a special air-tight copper container, and conveyed to the laboratory accompanied by a ticket bearing the necessary particulars.

Each sample is air-dried after arrival at the laboratory, and the amount of free moisture estimated. It is then further crushed in a jaw-crusher, reduced by a riffle to about 1 lb., and ground in a specially-designed grinder, and the whole passed through a standard 60-mesh sieve. It is then well mixed, ready for analysis.

This method of collecting samples of run-of-mine gas coals might have to be modified in cases in which the proportion of large coal was greater—namely, pieces more than 9 in. or so in diameter. The use of a larger collecting bucket or ladle is not considered practicable, owing to the greater strain on the sampler, and the force with which the coal pours from the shoot. Any systems of collection must be designed to avoid over-taxing the endurance of the sampler, and be capable of being properly carried out under all conditions likely to arise by day or by night, and in all weather. Covered galvanized bins are used for storing part samples during collection in cases where two or more kinds of coal are being loaded in alternate batches, and it is necessary to collect two or more samples simultaneously.

When this method of sampling was being worked out, before full operation, the accuracy was tested by having two or more samples taken simultaneously from the same batch of coal. This check is still carried out from time to time. Two or more samplers collect, crush, and reduce samples independently. The results obtained from 26 such experiments were satisfactory from a practical point of view; and the deviation from the mean does not in any case exceed ± 1 p.ct. for the samples of 1000 lbs. This includes the total errors due to sampling and analysis; but the errors in ash determination are, of course, very small. The experiments were carried out on coals of various qualities, and the errors in samples of high-ash coals do not differ very much from those of lower ash content. For 750 lb. samples, the deviation from the mean does not exceed ± 1·32 p.ct. Utilizing these figures in the probability integral, it was calculated that only two samples in every hundred are likely to be out by more than 1 p.ct.

Discussion.

Dr. Henry Louis, in a written communication, stated that he had often tried to put sampling on a purely mathematical basis as a problem in probabilities, but so far had always had to abandon the attempt and fall back on rule-of-thumb methods derived from experience. He could not help thinking that a method of sampling which allowed errors of ± 1 p.ct. was not good enough as compared with the refined methods of laboratory analysis.

Dr. J. T. Dunn congratulated Mr. Walker on the large amount of work that had been accomplished on this important subject. The exact method of sampling was largely a question of practicability. He took many samples from trucks by the "hammer-and-shovel" method, and had found the results to agree remarkably well, considering the objections to that system. In one case a large sample of 23,000 lbs. was collected under special conditions, and another sample taken from the same batch by the hammer and shovel method. The results for the percentage of ash differed only by 0·2 p.ct.

Dr. W. B. Davidson remarked that he used the method of sampling described, and entirely agreed with what Mr. Walker had said. He would like to ask the author if he had dealt with cases of washed small coal.

Mr. Drury pointed out that "ladle" sampling was not satisfactory in cases where coals had been screened and "rough picked;" the larger material usually lying above the smaller in the same truck.

Mr. Hewson asked whether the sampling ladle was plunged right into the stream, or whether the portions were collected from the sides. What number of portions were collected from each truck?

Mr. Sensicle asked what Mr. Walker would do if a piece of stone 14 in. long was caught in the sample. If a piece this size was in a truck, it would be necessary to take the whole truck for a sample. The convention of reporting results of analysis to two or three decimal places still persisted, though the errors in sampling were as much as 1 p.ct., even with great care. Sometimes he had no option but to take his samples from trucks. He had adopted the method of breaking up all the coal in a section of each truck, and then taking portions from this section. This plan was fairly accurate, if the coal was homogeneous.

Major F. J. Bywater said he did not believe that a proper representative sample could be taken from the top of a truck. He hoped the Committee of the Fuel Research Board on sampling would not recommend any method of collecting samples from coal at rest in trucks.

The Chairman (Dr. G. Weyman) referred to the importance of training the sampler, by the methods described by Mr. Walker. He said it was a very difficult matter to sample coal in many gas-works, as the coal was usually mixed before crushing.

Mr. Walker replied briefly to the discussion. His samplers were instructed to plunge the ladle into the middle of the stream of coal. First runnings and small side trickles were avoided. Sampling from the tops of trucks was very unsatisfactory. Accidental agreement might occur in one or two cases. It was necessary to test any method of sampling by taking a large number of observations. It was often possible to reduce the weight of the gross sample in some cases, as with washed nuts, when the bulk was fairly homogeneous. As the diameter of the sampling ladle bucket was 9 in., it was not often that pieces of coal larger than this were caught. Larger pieces did get wedged into the bucket at times. Large pieces of stone were more easily picked out on the picking belts; and it was generally pieces up to about 4 in. in size which escaped detection. His aim was to plunge the bucket into the stream often enough to reduce to a minimum the chances of catching an unfair proportion of dirt. The picking-out of dirt, either from a sample or on the picking belts, was obviously a difficult matter. It was not always possible to tell at a glance whether a piece was dull coal or a bit of dirt band. At least two colliery companies had agreed to accept the method as fair.

Wales and Monmouthshire Institution.—The meeting of the Wales and Monmouthshire District Institution of Gas Engineers and Managers will take place at Porthcawl on the 28th inst., when Mr. H. D. Madden, of Cardiff, will read a paper on "General Sales Propaganda."

National Gas Council Meeting.—Arrangements have been made for the seventh annual general meeting of the National Gas Council of Great Britain and Ireland to be held at the Hotel Great Central, Marylebone Road, London, N.W., on Tuesday, May 26, at 11.30. The President (Mr. D. Milne Watson) will present the annual report and statement of accounts.

INCOME-TAX ALLOWANCES FOR WEAR AND TEAR OF GAS-WORKS PLANT—

INCLUDING METERS, PREPAYMENT METERS, GAS STOVES, FIRES, &c.

By W. M. Galleway, of Whitby.

[Before the North of England Gas Managers' Association, May 1]

In complying with the request of your Committee to give a paper at this meeting, the writer is desirous, if possible, of assisting the secretaries and managers of small or medium undertakings, who, like himself, are responsible for the administrative, as well as the productive, departments of a gas company. One of the largest items of standing charges consists of rates and taxes. This paper deals with the latter, of which income-tax forms the principal part.

Prior to the year 1912, gas undertakings were placed in an anomalous position as compared with electric lighting undertakings, for, whereas the former were not allowed any depreciation whatever, the latter were allowed depreciation at the rate of 3 p.ct. on cables and 5 p.ct. on plant and machinery. In that year, however, a special meeting of the Institution of Gas Engineers was held, at which, very appositely, Mr. Robert Shadbolt, the brother of our President, occupied the chair. As the result of that meeting a scheme was evolved which has been adopted by many undertakings.

The scheme is as follows:

GAS UNDERTAKINGS OTHER THAN THOSE OWNED BY MUNICIPAL OR OTHER PUBLIC AUTHORITIES.

Scheme for Determining the Income-Tax Allowances to be Granted for Wear and Tear and Maintenance.

Plant, Machinery, and Mains.

1. No depreciation shall be allowed in respect of the plant, machinery, and mains, other than as specified hereinafter; but *in lieu* thereof all expenditure on repairs and renewals is to be charged in the company's accounts for income-tax purposes and allowed as working expenses, as and when incurred. All expenditure on extensions and improvements, where debited against revenue, to be distinguished and excluded from the said allowances.
2. Provided that, whenever any expenditure on such renewals is incurred and full effect cannot be given to its deduction in the year when incurred, owing to the profits or gains chargeable with income-tax in such year being less than the amount so expended, the balance of the said expenditure which has not been allowed may be carried forward and allowed in the following year or years, as is provided in the case of unallowed wear and tear by section 26 (3) of the Finance Act, 1907.

Gasholders.

3. In addition to repairs, depreciation shall be allowed at the rate of 3 p.ct. per annum on the written-down value—such value not to include tanks, except where constructed of steel or iron; and in no case is the cost of excavation to be included in the value upon which the depreciation allowance is computed.

Meters (Ordinary and Prepayment), Cookers, and Gas Fires.

4. In addition to repairs, allowance for depreciation shall be granted at the rate of 10 p.ct. per annum on the written-down value.

Services and Fittings.

5. No depreciation shall be allowed in respect of services and fittings; but *in lieu* thereof all expenditure shall be allowed as a trading expense as and when incurred. "Services" are to be understood as representing the pipes which connect the street mains with the properties served. "Fittings" are the pipes, pendants, and brackets within such properties, supplied by and at the cost of the Company. Where fittings so supplied are removed by the Company at any time, they shall be brought back into stock, if of any value, and re-issued without any charge against revenue except for the cost of repairs necessary to enable them to be re-issued. In the event of their not being re-issued, revenue shall be credited with the scrap value.

General.

6. In all cases where depreciation allowances are granted, renewals, if charged against revenue, shall be carefully distinguished and notified to the surveyor, in order that they may be added back to profits for the purpose of arriving at the income-tax liability.
7. If new works are erected, wholly or partially, on a new site, in place of old works abandoned or demolished, a reasonable allowance shall be granted for renewals in respect of the displaced plant, so far as it is actually renewed—such allowance to have regard to the original cost of the displaced plant, *less* any depreciation that may have been granted, but such allowance shall not include the cost of preparing the new site or erecting foundations for the new plant.
8. All renewals of parts which do not destroy the identity of the original article shall be allowed as repairs, except so far as they constitute an extension, enlargement, or other similar improvement in value.
9. Where renewals are allowable under this scheme, *in lieu* of depreciation, they shall be allowed notwithstanding that the cost thereof may not have been debited in the Company's accounts against revenue.
10. "Written-down value" means original prime cost, *plus* subsequent additions (including renewals which have not been allowed for income-tax purposes), *less* all allowances actually granted for income-tax purposes in past years in respect of depreciation.
11. "Expenditure" includes the sum expended on materials, labour, and incidentals.
12. This scheme shall take effect for the year 1912-13 and future years, and for years preceding where claims of depreciation are now awaiting settlement.
13. Where in any case allowances for depreciation have been made which are now to be discontinued, and they have not been exhausted by renewals already effected, the amount of such unexhausted allowances shall be deducted from the expenditure on future renewals as and when they are effected.

We desire to adopt the above arrangements, and hereby undertake to fulfil the conditions thereof.

On behalf of.....

Dated the ..... day of ....., 191 .....

....., Chairman.

....., Secretary.

In 1915 the Directors of the Company I have the honour to serve decided to adopt the scheme; but before giving notice to the Income-Tax Surveyor to that effect, referred the matter to a Rating Association of which they were members, and submitted copious extracts of capital expenditure on gasholders, meters, cookers, and gas fires. The reply from the Association was to the following effect.

"The figures suggested for forming the basis of a claim are suitable ones, although our Surveyor questions whether the Surveyor of Taxes will accept them. It is however quite in accordance with the terms of the agreement, and should be contended for. It is possible that the Surveyor of Taxes may only offer to agree to commence depreciation at the present value, and that will then open-up the question of past depreciation. It must be remembered, however, that, by claiming depreciation of the first cost owing to no depreciation having been claimed or allowed in the past, you are starting your depreciation on a higher basis, and at a time when the rate in the pound has been increased. Our Surveyor questions whether the Commissioners would agree to open-up past depreciation which has been allowed, and at the same time agree to a scheme brought forward for the purpose of blotting-out the past and starting afresh with a uniform and agreed basis. Although no depreciation had been allowed in the past, the question might arise as to the charges which have been made to revenue for renewals and possibly additions; but of this we have no knowledge. Any dispute or claim which may arise would probably involve an investigation upon these points.

"Our Surveyor suggests that, assuming you are clear on the question of renewals and improvements charged to revenue, you should request the scheme to be put into action, and forward your claim to the Surveyor of Taxes, and await any counter suggestion. From experience which he has had of other cases, the scheme produces a result favourable to the Gas Company, and in such cases it would seem that the Commissioners have made a bad bargain."

Acting upon the suggestion, a request (accompanied with extracts from the ledgers showing the capital expenditure) was sent to the Surveyor of Taxes, together with the suggestion that the writer and an auditor of the Company should wait upon him, and produce evidence in support of the application. This, however, was declined, and a counter suggestion made that the Surveyor should call and inspect the Company's books. The result of this subsequent inspection was that the Surveyor admitted our claim, and the scheme was put into operation and worked until 1921 without any exception being taken by the Revenue Authorities, notwithstanding the fact that the allowances for wear and tear exceeded the amount of tax deducted for the interest and dividends paid annually to shareholders.

A new Inspector of Taxes was appointed for the district about this time, and to our surprise refused to allow depreciation at the rates to which the Company were entitled, and which they had been allowed from their adoption of the scheme; his contention being that the Directors were compelled by the Customs and Inland Revenue Act, 1888, section 24, sub-section (3), to pay over to the Commissioners of Inland Revenue the full amount of the tax deducted from dividends and interest paid to the debenture stockholders and shareholders from year to year, irrespective of any claim which the Directors had for depreciation. He intended in future to allow only a sum equal to the amount written-off annually for depreciation as shown in the statements of accounts.

The Directors contended they were entitled to the full allowance of 3 p.ct. and 10 p.ct. respectively on gasholders, meters, gas stoves, &c., which the scheme provided for; and as the allowances had been granted for several years without question, there was no reasonable ground for raising an objection to what had become an established precedent. As the question of depreciation allowance was a most important one, they decided to obtain expert opinion. This opinion was favourable to their view, but it was decided on the expert's advice to obtain Counsel's opinion also. Counsel having further confirmed the

Directors' contention, the Inspector's objection was withdrawn, and the scheme is still in operation.

Statement A shows the form of statement of liability submitted annually.

STATEMENT A.

Statement showing the Amount of Liability for Income-Tax, Schedule D.

	£	s.	d.	£	s.	d.
(1) Profit as per revenue account						
(2) *Add*:						
Depreciation on gas stoves, &c.						
Interest allowed by bankers (if any)						
(3) *Deduct*:						
Allowance under Finance Act, 1919, section 18						
Interest charged by bankers (if any)						
Schedule A (offices, &c.)						
(3a) Income-tax carried to credit of rates account						
(4) Allowance for wear and tear of gas-holders:						
Capital cost *less* previous allowances, £ at 3 p.ct.						
Allowance for wear and tear of meters, prepayment meters, gas stoves, and fires:						
Capital cost *less* previous allowances . £						
Add expenditure during current year						
£ at 10 p.ct.						
Net amount of liability for tax						

The amount of liability under Schedule D, item No. 1, requires no explanation.

Item No. 2.—The income-tax authorities claim tax on all sums written off through revenue account for depreciation.

Item No. 3.—Under the Finance Act, 1919, section 18, gas undertakings are allowed for repairs a sum equal to one-sixth of the value of the Company's buildings which contain machinery, which was agreed by the Surveyor of Taxes and ourselves at £240, with £40 per annum allowance.

Item No. 3a.—Income-tax account was in credit in consequence of the allowances being in excess of the amount of tax deducted from debenture interest and dividends; and as the Company were entitled to charge the full amount paid in rates, they claimed, and were allowed, the balance of income-tax credited to rates account.

Item No. 4.—Is self-explanatory.

Statement B shows the annual amounts allowed for wear and tear during the several years in which the scheme has operated.

STATEMENT B.

Amount of Allowances Received in the Several Years during which the Scheme has been in Operation.

—	Gross Amount of Taxable Profits after making necessary additions.	Allowance for Wear and Tear.	Net Amount of Taxable Profits.
	£	£	£
Year ending Dec. 31, 1915	2,354	1,137	1,217
" " " 1916	2,334	1,139	1,195
" " " 1917	2,118	1,048	1,070
" " " 1918	2,076	964	1,112
" " " 1919	2,171	887	1,284
" " " 1920	2,552	823	1,729
* " " " 1921	1,935	903	1,032
* " " " 1922	1,937	832	1,105
" " " 1923	3,983	691	3,292
" " " 1924	4,218	669	3,549
" " " 1925-26	3,430	645	2,785
	£29,108	£9,738	£19,370

* During these years the allowance was increased 50 p.ct. on gasholders—viz., 4½ p.ct. instead of 3 p.ct.

Statement B proves beyond question that the scheme confers substantial benefits upon the undertakings that have already adopted it; and those undertakings that are entitled thereto would, in our opinion, do well to give serious consideration as to whether it is not to their interest to claim the allowances which it grants.

Discussion.

The CHAIRMAN said the paper was another instance of the value of careful records. It would be of special interest to company undertakings.

Mr. HERBERT LEES mentioned that he was present at the meeting of the Institution of Gas Engineers when the scheme was discussed, and his recollection of it was that those present were by no means unanimous as to its benefits to the gas industry. He adopted the system and it worked well.

Mr. T. P. RIDLEY (Newcastle) remarked that his Company had adopted the scheme.

Mr. NORMAN S. COX did not think the scheme was to the advantage of the industry. His Company had not adopted it.

Mr. R. WOOD (Barnard Castle) said that his Company had adopted the scheme to advantage.

NEW COLLIER FOR THE SOUTH METROPOLITAN GAS COMPANY.

On Saturday last, May 9, the s.s. "Redriff" was launched for the South Metropolitan Gas Company from the yards of the Tyne Iron and Shipbuilding Company, Ltd., at Willington Quay-on-Tyne. She is a sister ship to the s.s. "Camberwell," which was launched from the same yard early last year, and which has given great satisfaction in the service of the Company. The two ships are of a type specially designed to carry coal from the Tyne to the Company's gas-works on the Thames. The total deadweight is 2435 tons, on a mean draft of about 18 ft. 2 in. The length between perpendiculars is 244 ft., breadth moulded 36 ft. 6 in., and depth moulded 20 ft. 6 in.

The launch was carried out with complete smoothness; and the christening ceremony was performed, as the ship started on her journey down the ways, by Mrs. Frank Jones, wife of the Vice-President of the Company. It had been anticipated that the naming would be performed by Mrs. C. C. Carpenter, and Mr. Jones later referred to the unfortunate inability of the President and his wife to be present after all. The large company, while greatly regretting her absence, would assure Mrs. Carpenter that the bottle was gracefully, but very efficiently, broken by her substitute. The traditional christening by wine was quite unnecessarily supplemented by a drenching thunder shower of unusual violence—the only one of the day—which began as the party mounted the platform, and ceased exactly as the ship reached the water.

The company then adjourned to the moulding loft (which was gaily decorated with nautical flags) for tea as the guests of the shipbuilders. The good ship was toasted, after which Mr. G. F. Mulherion (the Chairman) gave the health of the South Metropolitan Gas Company, coupled with the name of Mr. Frank Jones, to which the latter replied.

Afterwards Mr. Jones proposed the health of the Tyne Iron and Shipbuilding Company, Ltd. It was a sad sight, he said, to see the endless succession of idle yards on both banks of the river, and one could only hope that times would change.

Mr. Mulherion, in reply, enlarged on the serious position of British shipbuilding. To him it was very questionable whether the Government should allow British owners to send orders to the Continent for ships which could be delivered duty free. The boat just launched was the last order his firm had; and it was a terrible blow to him that his men should have no further prospect of work, while nothing was being done to prevent orders from going abroad.

Mr. Mulherion then presented a souvenir of the occasion to Mrs. Jones, who returned thanks in an appropriate and graceful speech.

Other toasts were the North-Eastern Marine Engineering Company, Ltd., who are supplying the engines for the boat, and Commander T. C. Anderson, R.N., Marine Superintendent of the South Metropolitan Gas Company, who paid a warm tribute to the workmanship, from top to bottom, of the Shipbuilding Company.

Among those present were Major F. J. Bywater, M.C. (the South Metropolitan Gas Company's representative in Newcastle), and Mrs. Bywater, Mr. T. Curr (Chief Engineer, East Greenwich), Mr. T. S. F. Gibson (Chief Constructional Engineer), Mr. R. C. Macdonald (Chief Mechanical Engineer), Mr. L. M. Boyce (Chief Engineering Clerk), Mr. F. P. Tarratt (Chief Engineer of the Newcastle and Gateshead Gas Company) and Mrs. Tarratt, Mr. T. P. Ridley (Secretary of the latter Company), and Mrs. Walter King, widow of the late Editor and former proprietor of the "JOURNAL."

Birkenhead Gas Undertaking.—Speaking at a meeting of the Claughton Ward Conservative Association, Councillor S. Woodward said that under the chairmanship of Mr. Luke Lees the gas undertaking at Birkenhead had been changed entirely. The extensions had cost £200,000; and in view of the development of electricity, some people asked whether they were wise in expending such an amount. Experience had proved that the Gas Committee were justified in their action, for last year they had produced 1200 million c.ft. of gas, compared with 1104 millions in 1913—an increase of 5·7 p.ct. This showed that the gas undertaking had a great future before it. They had reduced the price to 3s. per 1000 c.ft., which compared very favourably with towns similarly situated. Had not the price of residuals fallen so much, the price of gas would have been reduced even further. He invited the ratepayers to visit the gas-works and see for themselves what had been done on their behalf in their own undertaking.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Low C.V. Gas and the Unaccounted-for Percentage.

Sir,—It is unfortunate that Mr. West should mar an otherwise excellent address [see "Journal" for April 22, p. 237] by an unjustifiable condemnation of gas of 410 B.Th.U. per c.ft. value. The harmful effects of NH_3, O_2, HCN, H_2S, and SO_2 on meters and mains have been fully dealt with by the Gas Investigation Committee, and do not require further emphasis.

Mr. West stated that, for several years before he took charge, unpurified gas was being delivered to the town; and in the very next breath he said that low-grade gas was to blame for the drying of diaphragms and pitting of meters and mains. Coming from such a tainted source as Newark, the condemnation was discounted in its nativity. We should, however, be better pleased, and it would be a lesson to gas engineers to be certain of their facts before rushing into print, if the Technical Press were much more aggressive in their criticism of such ridiculous statements.

The difference in the unaccounted-for gas when sending out 410 and 475 B.Th.U. is merely a coincidence peculiar to Newark. The distribution of gas of low calorific value had nothing whatever to do with it. For the past ten years we in Greenock have been sending out gas of low calorific value. Our declared value is 410, and our average unaccounted-for gas during the period under review is 3·19 p.ct. Another important point is the cost of meter repairs; and if low-grade gas has the harmful effects attributed to it, one would expect the cost of these in our case to be much higher than in places where high calorific value gas is supplied. But a glance at the "Gas World" Analysis of Corporation Accounts does not show this to be the case. We have been through private meter repairing establishments and have examined meters stated to be from districts supplied with 475-500 gas; and their condition was a positive disgrace to the industry. Indeed, our meter repair bill is so normal that we feel that meter makers, in continuing to guarantee meters, are wronging those who, like ourselves, supply clean gas with a minimum of inerts. That portion of the cost of a meter due to the "guarantee" clause must be considerable; and it would be interesting to know who are getting the benefit of it. We are not.

We have examined meters which have been in use with 410 B.Th.U. gas for seven and ten years, and find the leather diaphragms are in excellent condition and show no sign of drying. The tin casings of the dry meters are quite as good as those of meters used for the same length of time with 500 gas.

The secret of the efficient use of town gas—its effect upon meters, &c.—lies in its purity and low inert content.

Geo. Keillor,
Engineer and Manager.

Greenock Corporation Gas Department,
May 5, 1925.

Low-Temperature Gas and Gas from Low-Grade Coal.

Sir,—I was glad to read the articles on this subject which appeared in some of the daily papers last week. Without doubt valuable work is being done at the Government Research Station. The satisfactory production of good smokeless fuel should open up new markets in those Mediterranean countries where charcoal fires are still in vogue. Wood is mostly dear and scarce, so a suitably-produced smokeless fuel, which is an excellent substitute for charcoal, should find a ready and profitable market. For the home market to compete with coal for domestic purposes, smokeless fuel will need to be available at competitive prices. The most economic place to produce fuel is, as a rule, where there is a profitable market not only for the fuel itself, but for the rich gas obtained from the low-temperature process of carbonization. In most cases this will be found to be the existing gas-works throughout the country; and if the Fuel Research Board, as a result of their excellent work, can show that the installation of the necessary plant is a sound proposition for gas undertakings, they will have rendered a great national service.

In conjunction with this proposition, consideration should also be given to the question of installing suitable plant at the pit-head, for the complete gasification of such low-grade coal as will not economically bear the heavy cost of transport. The gas so produced could with ease be sent out by high-pressure pipelines to the different gas undertakings, where, mixed with low-temperature gas, or alone, it would meet all the requirements of a public gas supply.

Being sent out at high pressure, the mains involved would not be large, and in numerous cases they could be laid along the canals to the towns *en route*, and so save even the opening-up of roads. In America a similar arrangement of pit-head plant is being installed, and the gas produced is to be sent under pressure as far as 50 miles, for breaking down or supplementing natural gas supplies, which are becoming exhausted.

C. B. Tully.

Engineers' Club,
London, W. 1,
May 6, 1925.

Special Orders and the One-Half Proportion.

Sir,—In your editorial notes regarding the Aldershot Special Order you appear to have overlooked the fact that the extension of borrowing powers to one-half the amount of the share capital is a common clause in Special Orders. The novelty of the Aldershot application lies in the fact that it is the first application for such temporary powers under the Public Utility Companies (Capital Issues) Act to be made permanent.

A. S. Campbell.

Wellingborough Gas Light Company, Ltd.,
May 7, 1925.

[A note on this subject will be found on p. 446.—Ed. "G.J."]

Hiring Charges and Installation Delays.

Sir,—I have read Mr. Quigley's tirade about "gas companies of the Metropolis;" and as a hirer from one of the largest for the past thirty years, please allow me to enter my protest, and to say that, if consumers only take the trouble to send their complaints to the proper quarter (the head office), they will find every attention will be given to them, with the utmost civility.

At present I am a prepayment consumer; and here is a recent experience. I did not consider that I was getting as good a result as I should from the gas, so I wrote to the Company. The next morning I received a letter asking me to arrange my own time with an inspector, which I did. The interview took place, and within a fortnight the workmen were busy re-carcassing the house, with the result that I had four extra burners put in, and highly satisfactory lighting. A gas fire was installed, and the two cooking stoves were replaced by a larger one and a gas ring—much to the joy of the female section of my household.

And here is where an adequate response to legitimate complaint benefits alike consumer and Company. My brother came to see me, and at once wanted to know all about the beautiful light. I told him; with the result that he, being an ordinary consumer, purchased a gas fire for each of his rooms. My son did the same. All this means increased comfort and cleanliness and labour saved in three homes, and a greater consumption of gas for the Company.

The fact seems to me to be that your correspondent wrote to you instead of to his Gas Company. During my experience of Metropolitan Gas Companies, I have never once had to complain of the delays Mr. Quigley says he finds exist in his area; but, of course, one must be reasonable. Gas companies, like other industrial concerns, have their difficulties; but they are not slow to appreciate them, which is to the advantage of themselves and their industry, and for the comfort and convenience of their consumers.

Consumer.

Brockley, S.E., May 5, 1925.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Bills read a second time, and committed: Barrow-in-Furness Corporation, Bolton Corporation, Gas Light and Coke Company.

Bill reported, with amendments: Uckfield Gas and Electricity.

The further Standing Orders applicable to the following Bills have been complied with: Barrow-in-Furness Corporation, Bolton Corporation, Gas Light and Coke Company.

Gas Regulation Act.

On the motion of Viscount Peel, the draft Special Orders relating to the Brighouse Corporation, Pinner Gas Company, and the Yeadon and Guiseley Gaslight and Coke Company have been approved.

HOUSE OF COMMONS.

Progress of Bills.

The Statutory Gas Companies (Electricity Supply Powers) Bill has been reported from Standing Committee C, without amendment.

Bill read a second time, and committed: Hoylake and West Kirby Urban District Council.

Gas Regulation Act.

The draft Special Orders relating to the East Grinstead Gas and Water Company, Monmouth Gas and Water Works Company, and the Slough Gas and Coke Company were approved on the motion of Sir Burton Chadwick; and the Brighouse Corporation, Pinner Gas Company, and the Yeadon and Guiseley Gaslight and Coke Company Special Orders were also agreed to, on the motion of Colonel Moore-Brabazon.

Smokeless Fuel.

Sir Henry Slesser asked the Prime Minister, in view of the reports on the quality of the smokeless fuel produced by the low-temperature carbonization process, and consequent elimination of the smoke nuisance if it were universally employed for household fuel, if the Government would give facilities for bringing an Act into force providing for the compulsory carbonization of bituminous coal before use.

Mr. Baldwin, in reply, said that as soon as the Government are satisfied that these processes can be operated successfully on a commercial scale, they will consider the steps to be taken to achieve the object which all desire.

SOUTH METROPOLITAN GAS BILL.

HOUSE OF COMMONS COMMITTEE—Tuesday, May 5.

(*Before Colonel* Wheeler (*Chairman*), *Mr.* Cecil Wilson, *Mr.* Hanbury, *and Colonel* Heneage.)

The object of the Bill is to allow agreements to be made between the South Metropolitan Gas Company and other gas undertakers for mutual assistance. The only petitioners were the London County Council, who did not object to the proposals in the Bill, but asked that provisions should be made for the revision of the Company's basic price, which was granted by Parliament in 1920, there having been inserted in the Company's Act of 1920 a clause binding the Company to give an opportunity for revision within five years.

The promoters of the present Bill were represented by Mr. H. P. M'Millan, K.C., Sir Lynden Macassey, K.C., Mr. W. E.

Tyldesley Jones, K.C., Mr. Rowand Harker, and Mr. F. J. Wrottesley. The London County Council were represented by Mr. Jacques Abady.

Mr. H. P. M'Millan, K.C., in his opening statement, traced the history of the Company, in order to show how progressive had been the policy pursued. At the present time they supplied a population of between 1½ and 2 million people. The area of supply covered 52 square miles. There were 1340 miles of mains, and 400,000 meters. Gas was supplied within the territory of ten metropolitan boroughs, and three urban district councils outside London, and the Company employed 8000 workpeople. The capital amounted to 6½ millions of ordinary stock, and there was about 2½ millions of loan capital. There were 18,000 shareholders, and between £400,000 and £500,000 of the Company's stock was held by the workmen. Counsel then went on to discuss the resources of the Company (which, together with the proposals of the Bill, were set out in the "Journal" for Dec. 24, 1924, p. 842), and said that it was proposed that those resources should be used to the mutual advantage of this Company and the gas companies which abutted on to its area of supply. These were the South Suburban, the Croydon, the Wandsworth, Wimbledon and Epsom District, the Gas Light and Coke, and the Commercial Gas Companies. The powers sought were carefully hedged with limitations. In addition to the limitation that agreements for mutual assistance could only be entered into with statutory companies supplying in areas adjacent to the South Metropolitan Company's area, it was provided that the agreements must be subject to the approval of the Board of Trade. The particulars of any agreements entered into must be submitted to the London County Council, who were entitled to make representations to the Board of Trade, while local authorities affected, who were outside the County area, could also make representations. There was a clause to protect the Port of London Authority in connection with agreements which affected river accommodation. At present the South Metropolitan Company had power to amalgamate with any of the adjacent companies mentioned. The present proposals were considerably short of amalgamation, however, because that was not regarded as practicable or feasible at the present moment. There were several difficulties. The different companies had varying schemes of co-partnership, benefit funds, superannuation funds, and so on, the amalgamation of which would present considerable difficulty. Again, the prices of gas varied, and amalgamation might involve the continuance of differential prices, and consequent discontent, while the districts themselves to some extent varied in character. Very similar arrangements to those proposed in the Bill had received the sanction of Parliament in the case of electricity companies. The present proposals had undergone the scrutiny of the local authorities and others interested, and apparently had elicited only approval.

Coming to the opposition of the London County Council, he said that up to 1920 the legislation governing the Company might be said to have proceeded generally on the lines of that of the other London gas companies. In 1920, however, Parliament had sanctioned a new departure in the matter of charging for gas. The South Metropolitan Gas Company's Act of 1920 had established the heat unit basis for charging for gas supplied, and had established a new method of regulating the price of gas, and for applying the profits of the Company. The Bill had encountered considerable opposition when it was promoted in 1920. It had been opposed by the City of London Corporation, the London County Council, and by eight Metropolitan boroughs, and was also confronted with an adverse report by the Board of Trade. The general ground of that opposition was that the Company should await general legislation, which was then contemplated, and should not proceed with a Bill on their own lines. The House of Lords Committee before whom the Bill came had decided that, notwithstanding this opposition, the Bill should be considered, and, after hearing evidence, had allowed the Bill to proceed. But there had been inserted in that Bill, by agreement with the Company, a clause providing that the Company should, not later than the 1925 session, promote a Bill in Parliament proposing a revision of the provisions of the Act as to basic price, or giving an opportunity for such revision to be made. It was provided that the London County Council and the council of any metropolitan borough or urban district within or partly within the limits of supply of the Company should be entitled to be heard on such Bill. Thus, said Counsel, the present Bill gave the opportunity for a revision of the basic-price system. At present neither the City Corporation nor the eight metropolitan boroughs had any criticism to make, and there was no report from the Board of Trade. The Company's Act of 1920 enabled them to charge for gas on the heat value basis, and to introduce a system of charging which involved a basic price, and a system of participation in profits by consumers, shareholders, and worker co-partners in certain prescribed proportions. The basic price fixed by that Act was 11d. per therm, and the basic dividend was 5 p.ct.

The London County Council had taken advantage of the fact that the Company were in Parliament (as they were bound to be) in order to criticize the scheme; and this was quite legitimate. The Council submitted that the time had now come when uniform procedure should regulate the revision of the powers of charging of all gas companies supplying in the county; and they objected to the present Bill being passed unless provisions were inserted enabling the Board of Trade, at any time, on the application of the Company or the petitioners, to make an Order revising the powers of charging authorized by the Company's Act of 1920; or, alternatively, unless provisions were inserted reducing the basic price of gas fixed by the said Act and providing for the future regulation of such powers. Thus, said Counsel, the petition of the London County Council was simply that the Company ought now to be brought under the general legislation, and that the special provisions which had been sanctioned by Parliament in 1920, in recognition of the Company's merits, and the merits of their system, should be abrogated. The present proposal was that the basic price of 11d. per therm should be revised. Counsel submitted that the experience of the past five years had shown that Parliament were exceedingly wise in granting the basic price of 11d., which had been operated with great fairness and moderation by the Company. The working of the scheme had shown that the margin between the selling price and basic price had never been excessive. The elasticity of the system had been proved to be not greater than ought to be accorded to a well-conducted company; and he suggested that the margin ought to be considerably greater now than it was before the war. If the Company had been subject to the general legislation, instead of to the provisions of their own Act, they would have been entitled to a standard price in excess of 11d. The Gas Regulation Act was rather a dividend-protecting measure than anything else, and could not compare with the South Metropolitan Company's scheme, which had worked so admirably, and was not criticized by the consumers. Yet it was suggested that, for the sake of uniformity, the Company should be subjected to the provisions of the Gas Regulation Act. His submission was that experience had justified both the basic price of 11d. and the operation of the scheme to which that basic price was related, and that if the Company had been working under the general Act, the results would have been in no way so advantageous to the parties concerned. Also, as a matter of Parliamentary practice, it was an unheard-of thing to subject a Company, against their wish, to a code which, so far as all other companies were concerned, was merely optional. The Company looked upon this matter with some concern from the point of view of their working co-partners. The confidence of the workpeople, and the friendly relations existing, had been one of the greatest assets of the Company, and had been to the advantage of the public. He asked the Committee not to disturb that confidence.

Dr. *Charles Carpenter* (President of the Company, and Chairman of the Board of Directors) then gave evidence, and supported Counsel's statement. The proposals of the Bill were in the public interest; and because they were in the public interest, they were also in the interests of the Company.

His evidence concerning the trend of gas legislation, with regard to the methods of charging for gas, was interrupted by the adjournment of the Committee until Wednesday.

Wednesday, May 6.

Dr. *Carpenter* resumed his evidence, and said that, up to the time of the war, when the old sliding-scale was in existence, the then state of affairs was satisfactory. The most important principle was that the control of gas undertakings must be from within, and not from without; and this was the principle of the old sliding-scale. Due to the war, however, the old sliding-scale principle broke down; but it was inexpedient that there should be any control of prices by an outside authority. The Temporary Charges Act of 1918 was merely a stop-gap, and operated only to a limited extent. At the close of the war, therefore, it was necessary to review the whole position. In doing this there were three main matters—(1) the financial question, (2) the great advance on the technical side of the gas industry consequent on the work of the Fuel Research Board, and particularly that of Sir George Beilby, and (3) the question of still further improving the relationship between the Company and its employees. These matters were correlated, for not only had the old sliding-scale broken down as regards the shareholders, but it had failed as regards the workpeople. The great bulk of labour, he believed, did not object to capital getting a fair return, any more than capital objected to labour receiving a fair wage. While it might be arranged that capital and labour received a fair return, this did not meet the requirements of the consumer, because it might leave capital and labour with no incentive to put forth any greater efforts to improve the position of the consumer. Therefore, the basic-price system was devised. The South Metropolitan Company made the recommendations of Sir George Beilby and the Fuel Research Board, as to charging for gas by its heat value, the basis of its Bill of 1920. At the same time they did not proceed on the basis of the Gas Regulation Act of 1920—viz., to secure from the Board of Trade a therm price based on the increased cost of manufacture since 1914. The Company asked for an increase in the standard dividend from 4 p.ct. to 6 p.ct.; but Parliament decided the increase should be to 5 p.ct. A basic price of 11d. per therm was asked for and obtained. As a result of the experience with the basic-price scheme, he asked Parliament to allow the Company to continue under the scheme of their own Act of 1920, which was passed by Parliament in the face of opposition by a large number of local authorities and also an adverse report by the Board of Trade. That Act, for the first time, as regards co-partnership, enabled Labour to share on equal terms with Capital in the prosperity of the Company. The London County Council, concerning the present Bill, desired that the Company should not be allowed to continue in the exceptional position in which they had been placed by their Act of 1920. The Council first contended that the basic price of 11d. should be lowered, and also that the Company should be subject to revision upon the terms of the Gas Regulation Act of 1920. As regards the first, the margin available with the present basic price was only sufficient to allow the system to work satisfactorily. In the second place, Dr. Carpenter said he objected to revision by an outside authority who were not in a position to know what price should be charged. The margin at present between the basic price and the price charged was 2¾d., which was not more than enough to enable the Company to carry on the undertaking in a manner which would produce the best results. The benefit to the Company and the workpeople could only accrue if the price charged was less than the basic; and if a lower figure than 11d. were fixed, it would mean that neither the shareholders nor the workpeople would get anything worth having out of the basic price scheme. Apart from the suggested revision of the basic price of 11d., Dr. Carpenter said he objected to automatic revision, by which the Company would have to go through a particular performance whether there were good reasons or not. The Company were in Parliament with Bills sufficiently often to give Parliament full control over the Company. In 1920, when Parliament passed the Company's Bill, it was arranged that the Company should come to Parliament in five years, and give an account of their stewardship under the basic-price system. This was what they were now doing. He objected to the operations of his Company being sterilized by automatic machinery.

Mr. Jacques Abady then cross-examined on behalf of the London County Council.

Witness agreed that if the Company were successful in its present application, there would be no provision for revision of the basic price.

COUNSEL then explained that there was no intention on the part of the County Council to suggest that the basic price scheme should be altered. They asked that a clause should be inserted in this Bill giving the Board of Trade power to revise the basic price—not to alter it to the sliding-scale with a standard price—at any time, on application by the Council or the Company, but not so as to deprive the Company—*i.e.*, the shareholders or co-partners—of any benefit to which they might be entitled by reason of economy or good management.

Witness: My first question as a layman is: "Where is the snag?"

COUNSEL: There is no snag.

Witness: Then the answer is that I do not want the Board of Trade brought into this matter, directly or indirectly. I think Parliament are competent.

COUNSEL said the case for the London County Council was that revision of the 11d. basic price was due, and that if the Committee did not revise it in this Bill, and provide for revision in the future, then a clause should be inserted providing for periodical revision.

In the course of further cross-examination, it was put to the witness that a revision of the basic price would not interfere in any way with the new position of the employees as regards co-partnership under the Company's Act of 1920. Dr. Carpenter, however, contended that, inasmuch as any reduction would set back the point from which the benefit to the co-partners would start, the whole basis of the 1920 scheme would be seriously interfered with. The possibility of periodical reduction would be a violation of the principle of the Company's Act of 1920, upon which the workpeople had been treated since that Act was passed.

It was suggested by Mr. Abady that, so far as the incentive to reduce prices was concerned, the sliding-scale worked in the same way as the basic-price system; but Dr. Carpenter maintained that the sliding-scale would never have done for the South Metropolitan Company what the provisions of the 1920 Act had done.

Mr. ABADY wanted to know why the South Metropolitan Company objected to the clause which the London County Council asked should be inserted, when there was nothing in that clause which affected the Company.

Dr. *Carpenter* replied that one of his great objections to control by the Board of Trade was that it was possible, under the Gas Regulation Act, to fix a standard price for gas in London, which would do an enormous amount of mischief in increasing the price of gas to the consumer.

COUNSEL, dealing with the alterations in the Company's position brought about by the 1920 Act, said that the Act enabled the Company to distribute 5 p.ct. instead of 4 p.ct. to the shareholders without decreasing the price of gas, and allowed the 5 p.ct. to be distributed however high the selling price of gas. Also, he said, it enabled the increment to the shareholders over and above 5 p.ct., in respect of each price reduction, to be increased from £8813 to £11,000. It had given the co-partners a statutory right to a share, but it had enabled the shareholders to take 1 p.ct. more profit than previously, before the co-partners received anything.

Witness said that what it had done was to restore to capital what had been already restored to labour. Labour had had its standard wages raised in accordance with the post-war conditions, and so capital had had its standard raised in accordance with the changed conditions.

COUNSEL remarked that the scheme also enabled the point at which benefits were derived to depend not upon the price of gas to the ordinary consumer, but on the average price to all consumers, which was an advantage to the shareholder, because the average price was a lower figure than the price to the ordinary consumer.

Dealing with the clause suggested by the London County Council, and the provisions of the Gas Regulation Act, Mr. Abady said there was nothing in the clause submitted by the Council which would deprive the South Metropolitan Company of the benefit of any reduction in cost due to efficiency. If the reduction were due to efficiency, it was due to a cause within the control of the Company; and it was only in respect of reductions arising from circumstances beyond the control of the Company that the Board of Trade, under this clause or under the Gas Regulation Act, had power to make reductions in price. He maintained that in 1920, when the Company's Bill was before Parliament, the Company's Counsel had offered the revision of the basic price by a competent tribunal, if the London County Council pressed the point that 11d. was too high.

Dealing with the basic price of the South Metropolitan Company and the standard prices of the Gas Light and Coke Company and the Commercial Gas Company, Counsel said that, when the basic price of the South Metropolitan Company was fixed, prices were not at their peak, and they had applied for a 5 p.ct. dividend, which they were sure of, so long as they had the revenue, however much the price of gas increased. The Gas Light and Coke Company and the Commercial Company had applied for a standard price under the Gas Regulation Act at a later date, when prices were very high indeed, and, consequently, their standard prices were much higher. Also, as they were under the provisions of the Temporary Increase of Charges Act, and were deprived of their full dividends for a longer period than the South Metropolitan Company, their standard prices were fixed higher.

Witness said that, if the standard prices were fixed on the basis that the Gas Light and Coke Company and the Commercial Gas Company had had a reduced dividend for a longer period than the South Metropolitan Company, he should say that the Board of Trade had exceeded their powers.

COUNSEL then pointed out that the Gas Light and Coke Company had a co-partnership scheme, and that for every 1 p.ct. dividend paid to the shareholders the workmen received a certain amount.

Witness said that the distribution did not take into account the advances in wages made since 1914.

COUNSEL mentioned that in 1923 the co-partners of the Gas Light and Coke Company had received £63,666, and in 1924 £71,794, though the reduced standard price of 11d. was operating in the latter year. Did this show that the powers of the Board of Trade operated to reduce the workmen's share, as had been suggested?

Witness remarked that, though the amount distributed was increased, there were twice as many men to share the higher figure as there were to share the lower amount.

COUNSEL said that in 19 cases out of 20, when Parliament had fixed a standard price, that price was fixed under economic conditions which were more or less stable; and he obtained an admission from Dr. Carpenter that in 1920 economic conditions were not stable.

Mr. ROWAND HARKER, re-examining Dr. Carpenter, said that the clause in the 1920 Act of the Company relating to revision made no reference to any tribunal other than Parliament. The Company's attitude was that, if there were to be a revision of the basic price, they asked this Committee to consider whether the 11d. was to-day the right and proper basic price, rather than that the suggestion of the County Council, referring the matter to the Board of Trade, should be acceded to.

Dr. *Carpenter* agreed, and said that in 1920 the Company had never contemplated the possibility of periodic revision.

The Committee adjourned until Thursday.

THE COMMITTEE'S DECISION.

The Committee continued consideration of the Bill on Thursday and Friday. On the conclusion of the Company's case, Mr. Abady addressed the Committee on behalf of the London County Council, after which,

The CHAIRMAN said the Committee had come to the decision that the basic rate of 11d. was justified at the present time. This was their view from what they had heard during the proceedings. The Committee did not propose to insert the clause asked for by the London County Council bringing the Company under the revision of price clauses of the Gas Regulation Act; but a clause similar to clause 27 of the Company's Act of 1920 would be inserted, by which the Company would be compelled to come to Parliament in 1935 in order that there should be an opportunity of revision then. It was to be made clear, however, that this did not mean that there must necessarily be a revision, but that there would be an opportunity for revision if the circumstances warranted.

Mr. ABADY intimated that the London County Council might decide not to take any part in drafting the new clause, with a view to opposing in the next House.

The Committee then adjourned until Wednesday, May 13, when the promoters promised to bring-up a clause to give effect to the Committee's decision.

NEWPORT CORPORATION BILL.

When this Bill came before the Local Legislation Committee of the House of Commons, presided over by Colonel Sir JOSEPH NALL, last week, there was opposition by the Newport Gas Company, with respect to a clause giving the Corporation power to develop and lease lands; the Company's object being to prevent the Corporation leasing buildings on those lands, and binding the tenants not to use gas.

Mr. F. N. KEEN, representing the Corporation, said that all the Corporation were asking was that they might have power to lay-out and develop certain lands that they acquired, and to lease those lands, or part with them in other ways. They were not seeking to diminish the rights given to the Gas Company by Parliament to supply gas to all who wished to take a supply. It was suggested by the Gas Company that the Committee should add a proviso to the clause in question, to the effect that the Corporation should not make or impose, under the powers of this section, any term, condition, or restriction with respect to the form of light, heat, power, or energy to be used in any building or on any lands, or with respect to the taking from any particular local authority, company, body, or person of any form of light, heat, power, or energy.

COUNSEL, in reply to Mr. Neville (a member of the Committee), said that the electricity undertaking in Newport was carried on by the Corporation, and the Gas Company were apprehensive that, in developing buildings upon the lands which the Corporation acquired, and leasing them to tenants, they might impose some restriction confining the tenants to the use of electricity instead of gas.

Mr. *O. T. Morgan* (Town Clerk), in evidence, said that the Corporation had no intention of treating the Gas Company unjustly, and the latter could not complain that in the past the Corporation had treated them unjustly.

Witness, cross-examined by Mr. Rowand Harker (who represented the Gas Company), agreed that in the case of certain housing estates the Corporation had insisted upon the tenants of those properties entering into an agreement in which there was a clause providing that the tenants were not to use gas for the purpose of lighting.

Witness, in re-examination, referred to one of the estates, which was acquired under the Housing Acts for the erection of working-class dwellings. In August, 1920, in connection with the supply to this estate, the Gas Company had written asking that for each house supplied with a complete installation of gas lighting (five points), cooker, and wash boiler, the housing authority should contribute £12 10s. towards the installation costs, the gas appliances remaining the property of the Gas Company. In the event of the Corporation being prepared to give the whole of the public lighting of the estate to the Gas Company for a period of not less than twelve years, the housing authority would be asked to contribute £11 10s. per house only, the appliances remaining the property of the Gas Company. The Corporation had had an offer from the Electricity Department to lay all services and the lines on the estate, but the electricity undertaking required a guaranteed payment of £1000 a year until the revenue from the supply of current amounted to that sum. The facts had been laid before the Housing Committee, and, on the advice of the Housing Commissioner, the Committee had accepted the offer of the Electricity Department. One of the terms of the offer was that electricity only should be used for lighting the houses.

Witness, in reply to the Chairman, said that the clause did not prevent gas stoves being installed. The Corporation, he said, had not

imposed the condition referred to without consulting the Housing Commissioner.

The Chairman said it was surely outside the scope of the Housing Commissioner as to whether any ordinary citizen should be prevented, by the imposition of some unreasonable clause in an agreement, from using such kind of light or heat as he might wish to use.

Witness pointed out that the condition was part of the terms offered to the Corporation, and, in reply to Counsel, said the apprehension of the Housing Committee was that, if they accepted the offer of the Gas Company, it would make the housing estate more burdensome than if electricity were installed by the Corporation.

In regard to another housing estate it was put to witness that the Corporation had never even approached the Gas Company; and the reason he gave was that it was assumed the same terms would be applicable.

Major Colfox (a member of the Committee) ascertained that there were both electricity and gas mains very near to the sites with which the present Bill was concerned, so that there was no question of having to incur the cost of laying new mains, and there would be no capital cost to be borne by the gas or electricity undertaking. Therefore, there would not be any very great disparity of price between electricity and gas, and there would be no objection, from the tenant's point of view, to having the proviso suggested by the Gas Company inserted in the Bill.

Witness said he did not suppose for a moment that the Corporation would think of imposing such a restriction in these cases; but, at the same time, they did not want a precedent created by the insertion of this proviso.

Major Colfox, dealing with the prohibition of gas for lighting in the housing estates previously referred to, said that the Corporation, in the person of the electricity undertaking, wished to make the Corporation, in the person of the Housing Committee, give them a monopoly.

Witness disagreed, and said that those were the terms upon which the electricity undertaking were prepared to supply; and the Housing Committee had not accepted those terms until they had consulted the Ministry of Health through the Housing Commissioner.

Mr. *A. N. Moore* (Electrical Engineer) said the Electricity Committee's request that the Gas Company should not be allowed to supply gas for lighting purposes was for the reason that, unless the Electricity Committee could be assured of a reasonable return on their capital expenditure for lighting purposes, they would not be able to justify their expenditure as part of their general balance-sheet.

Cross-examined by Mr. Harker, witness said he was not aware that the question of restricting tenants with regard to the use of gas applied to other premises besides the housing estates referred to. Mr. Harker mentioned, however, the case of a refreshment room, which was Corporation property, where the tenant desired to have a gas cooker, and suggested that the Corporation had refused to allow a gas cooker to be installed, but had insisted upon the tenant having an electric cooker. Witness said he knew nothing about this.

After the Committee had conferred, the Chairman said they did not think they need pursue the Gas Company's petition further. Their decision was that the proviso should be added to the clause.

STATUTORY COMPANIES (ELECTRICITY SUPPLY POWERS) BILL.

This Private Member's Bill, promoted by Mr. Clarry in the House of Commons, was disposed of in less than five minutes by a Standing Committee of the House on Tuesday, May 5.

There were no amendments, and the Bill was reported to the House accordingly. The Bill, as we have already pointed out, removes the present disability on gas companies, and enables them to apply direct to the Electricity Commissioners for Electric Lighting Provisional Orders, and to apply their capital for the purposes of working such electricity powers.

The next stage is third reading.

UCKFIELD GAS AND ELECTRICITY BILL.

The Unopposed Committee of the House of Lords have ordered this Bill to be reported for third reading. Its purpose is to incorporate and confer powers upon the Uckfield Gas and Electricity Company; and its main provisions were set out in the "Journal" for Jan. 28, p. 210.

A number of amendments have been made. In the first place, the incorporation of the Company is to take place as from Jan. 1, 1926, instead of Oct. 1, 1925. Also, meetings are to be held yearly in March, instead of June.

With regard to Directors, the number is to be six, but it can be varied so that there are not more than seven or less than five. The qualification of a Director is to be the possession, in his own right or in the joint right of himself and another, of stock to the nominal amount of not less than £100; but a proviso has been added to the clause dealing with this matter, to the effect that the qualification of at least three of the Directors shall be in gas capital of the Company.

If mains for the distribution of electricity have not been laid by the Company in any rural parish in the limits of supply within three years, the Minister of Transport is to be empowered to revoke the powers of supply, if he thinks fit. In the case of gas supply, if mains are not laid within five years in any of the rural parishes or parts of parishes within the area of supply, any local authority, company, or person may apply for an Act of Parliament or Special Order for the purpose of providing the supply, and for the repeal of the Company's powers.

In the Bill as deposited, provision was made for the partial repeal of the powers of the Crowborough District Gas Company for the supply of gas and electricity, and of the Lewes Gas Company in respect of the supply of gas, in certain areas; but the provision for the repeal of powers of the latter Company has now been struck out. The area of supply of gas and electricity by the Uckfield Company has also been modified.

A clause has been inserted giving power to supply, but not manufacture, electrical fittings and appliances.

LEGAL INTELLIGENCE.

GAS MANAGER'S ACTION.

On Friday last Mr. George Helps, General Manager of the Nuneaton Gas Company, applied to Mr. Justice Lawrence, in the Chancery Division, for an Order directing the Oldham Corporation to give further and better particulars of their defence in an action which Mr. Helps is bringing against the Corporation—an action which relates to alleged secret processes in the manufacture and supply of gas. Mr. Trevor Watson, for the plaintiff, observed that his client's secret depended on the supply of gas of low calorific value. Defendants, however, stated that, having disclosed his system in specifications, Mr. Helps had no secret. The Corporation, independently of Mr. Helps, had been using gas of a diminishing calorific value for years. His Lordship held that the Corporation ought to state the calorific value of the gas supplied at the Higginshaw Works, and the occasions on which they had distributed gas of a lower calorific value than the plaintiff since the erection of the works. His Lordship also directed defendants to give particulars of certain interviews with Mr. Helps on which they relied.

GAS PLANT DISPUTE.

On May 6, in the Divisional Court, composed of the Lord Chief Justice and Justices Avory and Shearman, the case of *Newtownards Urban District Council* v. Messrs. *Perry & Co., Ltd.*, came up for argument.

Sir Malcolm Macnaghten, K.C., for Messrs. Perry & Co., said the matter came before the Court on a special case stated by an Umpire under section 19 of the Arbitration Act, 1889, for the opinion of the Court on a question of law in an arbitration between the Newtownards Urban District Council and Messrs. Perry & Co. Counsel said he would have to ask that the case might be remitted, on the ground that the Umpire had said things he ought not to have said, after hearing one side only, and had omitted to state facts which were essential for arriving at the conclusion of law which the Court was asked to advise on. There was a contract between the Council and the firm for the installation, by the latter, of a water gas plant. The Council made a claim against the contractors that the plant was not up to the contract. The matter was referred to arbitration; each party appointing an arbitrator, and the Umpire being appointed by the Court. Counsel then referred to the lengthy proceedings that took place in the arbitration, and said the case, in its present form, could not possibly stand.

Eventually it was agreed by consent that the case should be remitted to the Umpire with certain directions, to proceed with the case and make an award in the form of a special case.

GAS AND WATER DISPUTE AT LIVERPOOL.

An action brought by the Huyton and Roby Gas Company against the Liverpool Corporation to determine the responsibility for damage to a gas main and supply pipes, was resumed before Mr. Justice Finlay, at the Liverpool Assizes, on April 30. The Gas Company claimed that when the new Corporation water main was laid at Roby in 1923, the gas main and supply pipes lost their support and were pressed down by a heavy roller, causing an explosion and serious fractures to develop, together with considerable escape of gas. The Liverpool Corporation denied that they had caused the damage, and said they were not guilty of negligence. They further contended that the fractures were due to the old and defective condition of the gas pipes. A mass of expert evidence as to the formation of the two lines, the manner in which excavations had been made, and the reasons for the gas escaping, was tendered; and after legal argument, his Lordship deferred judgment.

IMPORTANT RATING TEST CASE.

COURT OF APPEAL.

(*Before Lords Justices* Bankes *and* Atkin, *and Mr. Justice* Lawrence.)

Metropolitan Water Board v. Assessment Committee of the Kingston Union and Another.

An important point in connection with rating assessments was raised in this appeal by the Assessment Committee of the Kingston Union from a judgment of a Divisional Court consisting of the Lord Chief Justice, Mr. Justice Avory, and Mr. Justice Acton. The Metropolitan Water Board have underground works in the parish of Teddington, and surface reservoirs in the parishes of Hampton Wick and Hampton. All these parishes are included in the Kingston Union area; and in arriving at assessments upon the undertakings mentioned for rating purposes, the Assessment Committee ascertained the capital value in each parish, and then applied a remunerative rate of interest.

The Water Board appealed to the Middlesex Quarter Sessions, contending that by this method they were over-assessed in regard to both the gross estimated rental and the rateable value, and that the method to apply should have been to assess the undertaking in each parish upon the usual principle of finding the rateable value of the whole from the receipts and expenditure, and then distributing it over the different parishes. The Assessment Committee objected that this method did not comply with the Parochial Assessments Act, 1836. The Middlesex Quarter Sessions upheld the Committee's contention, and stated a case for appeal.

The case stated showed that the gross receipts from the undertakings in 1920 were £3,105,649, and the working expenses £1,593,287, leaving net receipts £1,512,362. The differences between the Assessment Committee's figures and those of the Water Board were as follows:

—	Assessment Committee.	Water Board.
	£	£
Teddington—		
Gross rental	2,484	1,248
Rateable value	2,114	832
Hampton Wick—		
Gross rental	2,061	1,302
Rateable value	803	868
Hampton—		
Gross rental	85,446	52,220
Rateable value	67,862	34,220

The Divisional Court allowed the appeal, holding that the contractor's principle was not the principle to be observed, and that regard should be given to the revenue account and the receipts of the undertaking, and the restrictions placed upon it by statute. The present appeal by the Assessment Committee was from that decision. The case was a test one, and was said to have an important bearing upon similar undertakings throughout the country.

Mr. Mitchell Innes, K.C., Sir Malcolm Macnaghten, K.C., and Mr. Hedley (instructed by Mr. W. Taylor, Clerk to the Kingston Union), appeared for the Assessment Committee; and Mr. Tyldesley Jones, K.C., and the Hon. S. O. Henn Collins (instructed by Mr. C. A. Hunt) for the Water Board.

Delivering reserved judgments, the Court by a majority (Lord Justice Atkin dissenting), dismissed the appeal, thereby affirming the decision of the Divisional Court.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for April 29.]

Nos. 10,184-10,837.

Askania-Werke Akt.-Ges. vorm Centralwerkstatt Dessau und C. Bamberg-Friedenau.—"Gas-fired furnaces." Nos. 10,685, 10,823.

Coley, H. E.—"Apparatus for manufacture of gas." No. 10,562.

Eckardt Akt.-Ges., J. C.—"Meters for compressed gas." No. 10,390.

Ray, F. M.—"Scrubbing gases." No. 10,199.

Sears, S. A.—"Apparatus for controlling proportions of gases in mixtures." No. 10,385.

Selas Gas & Engineering Company, Ltd.—See Sears, S. A. No. 10,385.

Standard Gas Equipment Corporation.—"Gas heating-apparatus." No. 10,728.

Svenska Aktiebolaget Gasaccumulator.—"Gas-illuminated signals." No. 10,517.

Synthetic Ammonia & Nitrates, Ltd.—See Ray, F. M. No. 10,199.

Terrell, T.—"Manufacture of metallic rings for gas mantles." No. 10,219.

[Extracted from the "Official Journal" for May 6.]

Nos. 10,838-11,473.

Andrews, C. W.—"Method of treating gaseous fluids." No. 11,199.

Brassert, H. A.—See Andrews, C. W. No. 11,199.

Cheesman, T.—"Apparatus for treatment of tar." No. 11,394.

Gunning, J.—"Apparatus for automatically operating gas valves." No. 11,078.

Jassawalla, K. S.—"Combined cooker, geyser, &c." No. 11,250.

Jennings, W. F.—"Gas-compressors." No. 11,124.

Kempton, C. H. & C. H. A.—"Burners, &c." No. 11,306.

Prestage, E.—See Jennings, W. F. No. 11,124.

Towyn Gas-Works Project.—The Towyn Urban Council at a recent meeting discussed the desirability of purchasing the Towyn Gas-Works. It was resolved that the Aberdovey and Towyn Improvement Committees should consider the project, and report thereon.

Imperial Continental Gas Association Centenary.—A proprietor has given notice of his intention to move, at the ordinary general meeting of the Association to-day: "That a sum of £2000 be placed at the disposal of the Board to be utilized for the permanent endowment of such philanthropic object as they may select, having as its object the extension of assistance to deserving cases occurring among the families of employees of the Association; the said endowment to be an abiding memorial of the proprietors' gratitude to the Directors, past and present, for the valuable services rendered by them to the Association during the period 1824 to 1924."

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following notices have appeared in the "London Gazette" regarding applications to the Board of Trade under the Gas Regulation Act.

Padiham Urban District Council.

The maximum price now authorized in respect of the supply of gas by the undertakers is 6s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 5d. per therm.

It is also proposed that an additional charge per therm of 2·25d. should be authorized in respect of gas supplied through a prepayment meter, with a further additional charge per therm of 0·4d. where the fittings supplied to be used with the prepayment meter include a cooking stove.

AMENDING ORDER.

Wakefield Gas Light Company.

The Board of Trade give notice that the Wakefield Corporation have made application under sub-section 3 of section 1 of the Act for an Amending Order revising the powers of charging authorized by the Wakefield Gas (Charges) Order, 1922, whereby it is desired that a standard price of 11·8d. per therm shall be prescribed.

SPECIAL ORDERS.

Brentwood Gas Company.

The Company are seeking a Special Order to enable them to use scheduled land for gas purposes, to raise additional capital, to establish co-partnership, and to make new provisions with regard to the supply of gas.

Tawe Valley Gas Company.

Application is to be made by the Company to the Board of Trade for an Order under section 10 of the Act to authorize them to raise additional capital, to make provisions as to dividend, to draft further regulations with regard to the supply of gas, and for other purposes.

Worthing Gas Light and Coke Company.

The Company are applying for an Order under section 10 to extend their limits of supply so as to include the parish of Findon, to authorize the Company and the Littlehampton Gas Company to enter into arrangements for the supply of gas in part of the parish of Ferring, and to enable the Company to raise additional capital, to issue capital for profit-sharing, to make regulations governing the supply of gas, &c.

DECLARATIONS OF CALORIFIC POWER.

Ellesmere Port and Whitby Urban District Council.—425 B.Th.U. (July 1.)

Heathfield and Waldron Gas Light and Coke Company, Ltd.—450 B.Th.U., in substitution for 490 B.Th.U. (Aug. 9.)

BELFAST GAS UNDERTAKING.

The policy of making citizens more interested in the greatest of their municipal undertakings is being successfully adopted by Mr. J. D. Smith, M.Inst.C.E., Engineer and Manager of the Belfast Gas-Works, on whose invitation members of the Belfast and District Chamber of Trade visited the undertaking last week.

The visitors, who were met by Mr. H. M'Laurin, J.P. (Vice-Chairman of the Gas Committee), and Messrs. H. M'Keag and G. Stewart, were conducted round the works by Mr. Smith and several members of his staff; and the whole process of manufacture and distribution was explained to them. The plant can produce approximately 14 million c.ft. of gas per day, and the daily output of one retort—about 55,000 c.ft.—is equal to the daily output of the whole works in their early days. The visitors also inspected the water gas plant, the meters, the generating station, the chemical works, and the purifying and cooling plants. After visiting the stove warehouse, the party assembled in the staff dining hall.

Mr. M'Laurin said that, since Mr. Smith took over the management of the works in 1910, the output of gas had been increased by 70 p.ct., and it was still increasing. During that period £576,000 had been spent on the improvement of the works, and a new holder had been erected at a cost of £156,000. If the Belfast public could see how the gas-works were conducted, they would recognize what a good manager was Mr. Smith. They wanted to make Belfast a smokeless city, and it would go a long way towards this if they could induce householders to use gas instead of coal fires.

Mr. J. M. Colton, President of the Chamber of Trade, in proposing a vote of thanks to Mr. Smith, said the Chamber were strongly in favour of economy and efficiency; and, so far as they could judge, there were economy and efficiency in the gas-works.

Mr. W. J. Pride, in seconding the motion, remarked that a great deal of the material represented by the bye-products was formerly imported into Belfast. The output of tar was as great as the amount used in the six counties, and one county took about half the quantity produced. He hoped other counties would use the tar produced at the chemical works they had just visited.

Mr. Smith, in reply, said he had been gratified by the interest the visitors had displayed. It was just fifty years since the Corporation had taken over the gas-works from the old Company; during that time the undertaking had handed over for the benefit of the ratepayers more than £500,000. They tried to run the works as economically as possible, and it was the wish of the management and the Committee that they should sell gas at the cheapest possible price.

EXAMINATION UNDER THE EDUCATION SCHEME OF THE INSTITUTION OF GAS ENGINEERS.

Forwarding copies of the questions set in the examination in Gas Supply on the 2nd inst., and in that of Gas Engineering last Saturday, Mr. Walter Hole, the Organizing Secretary to the Education Scheme of the Institution of Gas Engineers, points out that in the Higher Grade and the Diploma the paper has been divided into two sittings, each of three hours' duration, instead of, as previously, one paper of four hours. This has been done at the request of students themselves, many of whom last year found it impossible to complete the paper in the time then allotted.

The Examiners were, for Gas Engineering, Messrs. H. D. Madden, M.Inst.C.E. (Cardiff), W. J. Smith, B.Sc. (Bolton), and J. S. Thorman (London); and for Gas Supply, Messrs. S. B. Chandler (Tottenham), George Keillor (Greenock), Stephen Lacey, B.Sc. (London), and A. B. Roxburgh (Newcastle-on-Tyne).

GAS ENGINEERING.

Ordinary Grade (External Examination).

From 2 to 6 p.m.

Sketches can be adopted to obviate long and involved statements.
The general neatness of the paper, including that of the sketches, and also lucidity of expression, will be taken into consideration in assessing marks.

Eight questions only to be attempted.

1. Give a front and cross-section of a horizontal setting and furnace, indicating the passage of the gases.

2. Describe, with the addition of sketches, the principles of a typical method of mechanical retort charging and discharging. State the minimum time taken over the complete operation of charging and discharging. Give the weight of charge such mechanical charger would lay suitable for efficient carbonization, giving the length and size of the retort.

3. State what, in your opinion, is the best combustion chamber temperature, giving your reasons. What means are adopted to ascertain combustion temperature?

4. Give a description of the process of water gas manufacture. Describe, with sketches, the apparatus used.

5. Sketch and describe one type of atmospheric condenser. Give the size and area necessary for cooling one million c.ft. of coal gas per day, for an inlet temperature of 130° Fahr., to 70° Fahr., with atmospheric temperature 50° Fahr.

6. Describe a gas exhauster, and state how this is driven and controlled. State the effects of under-exhausting and also over-exhausting on both gas and tars, &c.

7. Describe plant for removal of tar and ammonia from the gas. State the desired temperature which you would expect to find at the inlet of such plant, and give your reasons. Describe what should be the arrangement and condensation to ensure that the whole of the ammoniacal liquor sold or delivered to the sulphate plant is not less than 10 oz. strength.

8. Describe the apparatus and method of testing the calorific value of coal gas. Show the calculations. What special precautions should be taken to ensure accuracy?

9. Describe the chemical and physical principles involved in (1) the regenerator furnace, (2) the setting. Give the chemical equations representing the reactions which take place.

10. Describe, by means of a sketch, the principles of a spiral-guided gasholder.

Higher Grade.

Part I., from 2 to 5 p.m.

(*Four questions only to be attempted.*)

1. Give the principal sources of gas coal, and indicate in what respects such coals differ. State their behaviour under carbonizing conditions.

2. Give the chemical composition of coal gas and water gas, and sketch and describe the apparatus, giving procedure for the complete analysis of both. Show how the calorific value of coal or water gas is arrived at from the chemical composition, giving an example.

3. State the general investigations and arrangements you would make when taking over the control of a horizontal carbonizing unit to obtain the most efficient results, both as regards therm and residual yields. Give the analyses of producer gas and waste gas which you would endeavour to obtain for maximum efficiency.

4. Describe what you consider are necessary conditions in the carburetted water gas plant to obtain efficient results, stating: (1) The steam and blast pressure; (2) the cycle worked and the reason for its adoption; and (3) the temperature of the carburettor under the varying quantities of oil. State with what regulating instruments you would expect a modern carburetted water gas plant to be equipped.

5. Show the chemical reactions that take place in the removal of sulphuretted hydrogen and the revivification of the purifying material. By what means can the activity of the purifying material be assisted? Describe a method for estimation of sulphur and tarry material in spent oxide.

Part II., from 6 to 9 p.m.

(*Four questions only to be attempted.*)

6. Describe a method for coke handling with which you are familiar, giving a sketch. What precautions would you take to ensure minimum wear and tear?

7. In construction of foundations, what weight per sq. ft. would you estimate that virgin soil would carry without sinking? (Clearly explain the type of virgin soil referred to.) What foundations would you put in for a load considerably exceeding that which the virgin soil or made-up ground would be capable of carrying without sinking? Explain the principles you would adopt, and give a sketch.

8. Describe, by the aid of sketches, the manufacturing process of sulphate of ammonia on modern lines. State how you would arrive at the efficiency of conversion of the ammoniacal liquor supplied into sulphate.

9. State where, in the process of manufacture, you would recommend the application of mechanical handling of materials in place of hand work; also the power recommended, with your reasons for same.

10. Describe, by the aid of a sketch, the type of grate suitable for burning small low-grade fuel in a works boiler. What precautions would you take to obtain the maximum efficiency? State what steam production you would expect to obtain per lb. of breeze under ¾ in. in size, containing 12 p.ct. moisture and 12 p.ct. ash.

Diploma.

Part I., from 2 to 5 p.m.

(*Four questions only to be attempted.*)

1. Review the effect of the varying percentage of oxygen in coal on the products of carbonization. Compare in this respect any two coals from different coalfields with which you are familiar.

2. Compare the effect of high and low steaming on the throughput and on the products of coal carbonized in a vertical retort system. Give an approximate analysis of the gas under each condition, stating the extent of steaming. Compare the behaviour and throughput of coal per retort in any well-known type of vertical retort installation, reciting two distinct coalfield types.

3. What do you consider the depth of fuel bed necessary in a horizontal retort house producer or generator for the production of good producer gas? Give analysis of such gas, and give and discuss the grate area you would recommend per ton of coal carbonized, sketching the type of grate referred to. Discuss the effect on the quantity and quality of the gas and residuals produced by a change of about 12 p.ct. variation in the temperature of a combustion chamber of a horizontal installation.

4. State briefly the causes of the existence of naphthalene in crude coal gas, and describe in detail a method for its complete removal from the gas—(*a*) giving the quantity of absorbent necessary, and (*b*) stating how this is disposed of when spent.

5. Discuss the application and merits (technically and commercially) of waste-heat recovery boilers to—(*a*) carburetted water gas plant, (*b*) vertical retort settings, and (*c*) horizontal regenerative settings. Show in each case the controlling influences and methods you would adopt for successful and economical operation, mentioning the quality and temperature of the waste gases you would expect available. State in lbs. the steam developed (from and at 212° Fahr.) per lb. of fuel used in the generator (indicating also the generator fuel consumption). Give your calculation, with the temperatures and CO_2 content of the waste gases at the various points in the setting, regenerator, waste-heat boilers, and the connections leading thereto, which you have assumed in your calculations.

Part II., from 6 to 9 p.m.

(*Four questions only to be attempted.*)

6. Sketch a cross-section of stills and saturator of a modern sulphate of ammonia plant. Explain the points to which you would give detailed attention to ensure satisfactory and efficient working, and give your reasons. Briefly describe, and give your reasons for, the necessary care and treatment of the waste gases and effluent liquor. What amount of sulphate of ammonia of 21 p.ct. nitrogen would you expect to obtain theoretically from 10,000 gallons of 10-oz. ammoniacal liquor? Show your calculations for this.

7. Assuming you are in charge of a works containing (say) the following plant, (*a*) one section of horizontal retorts, (*b*) one section of vertical retorts (steamed), and (*c*) one section of carburetted water gas or blue gas plant, discuss briefly the points you would watch, and describe what steps you would take when the three plants were in operation together, to ensure a proper mixture and to maintain the outlet gas at—(1) regular and constant calorific value, (2) regular and constant composition, and (3) regular and constant specific gravity. Explain why this constancy of values is essential.

8. State the prime movers you would employ, and the powers you would adopt, in the mechanical equipment of a medium-sized works, to reduce laborious work to a minimum, commencing with the handling of coal, and dealing with all operations throughout. Give your reasons, and state the efficiencies you would expect from each of the plants you would propose to instal.

9. Give a general résumé of, and illustrate by sketches, the methods adopted for foundational work in gas-works construction, mentioning the nature of the varying sub-soils which may be met, and the types of foundations which can employed on each. State how you would arrange foundations to carry on soft-yielding soils the following: (*a*) Heavy walls of horizontal retort houses, (*b*) concentrated loads as in the case of vertical retort settings.

10. Gas-works are bound to comply with certain Acts of Parliament in their methods of manufacture of gas and residual bye-products. Enumerate the leading points of the Gas Regulation Act, Alkali, and other Acts that operate and have to be observed in gas-works.

GAS SUPPLY.

Ordinary Grade (External Examination).

From 2 to 6 p.m.

Sketches can be adopted to obviate long and involved statements.
The general neatness of the paper, including that of the sketches, and also lucidity of expression, will be taken into consideration in assessing marks.

Six questions only to be attempted.

1. If gas reported escaping into telephone street boxes, state what immediate action you would take after arriving at the site, and how proceed to locate the leakage. Assuming the escape traced to a

broken main, describe the work of temporary and permanent repair—the latter with the aid of sketches.

2. A main 6 in. in diameter and 1000 yds. in length has been capped at either end, and the contained air raised to a pressure of 6 in. as measured by a water gauge; thereafter the pressure is observed to fall at the rate of one-tenth in 3 minutes. Calculate the rate of leakage in c.ft. per hour.

3. Make diagrammatic sketches of (*a*) a constant pressure governor, and (*b*) a constant volume governor for controlling gas flows up to (say) 30 c.ft. per hour. Show what forces maintain the governors in equilibrium when in action, and bring-out clearly points of similarity and difference in design. Which do you think is likely to be the more reliable in use, giving reasons?

4. State precisely how you would proceed to test a meter *in situ*, and how you would ascertain that it was of adequate capacity for its work. What are the faults that may develop in meters in use, and to what are they due?

5. Give the composition of a good blow-pipe solder for meter fixing. Also name a suitable flux, and describe its function. What tools is a fitter likely to require when fixing a 20-light meter in a private house?

6. Make sketches showing the construction of the burner, mixing chamber, and nozzle of a modern gas fire. Explain what provision is made for dealing with different pressures and gases, and describe the provisions made to ensure silent burning.

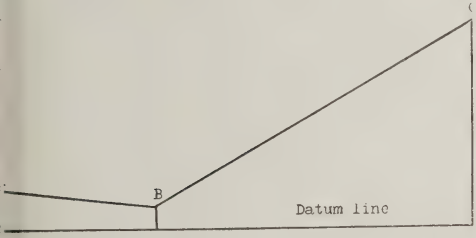
7. Describe, with the aid of sketches, the construction of a sealed type of geyser, and indicate the passage of the products of combustion and water respectively through the apparatus. To what would you pay particular attention when installing a geyser.

8. State how you would determine the thermal efficiency of a boiling burner in a cooker hotplate under working conditions. Give a calculation illustrating your answer. How have the higher efficiencies of modern hotplates been attained?

HIGHER GRADE.

Part I., from 2 to 5 p.m.

(Five questions only to be attempted.)



1. The diagram above represents a 12-in. pipe-line. The length of the pipe-line A, B, C = 1000 yards. The altitudes of A, B, and C are 100, 50, and 400 ft. respectively above datum. (*a*) If the specific gravity of gas = 0·6 and the gauge pressure at A = 3 in., what will be the pressure at B and C when no gas is flowing in the pipe? Sp. gr. of water as compared with air may be taken as 780. (*b*) When gauge pressures at A and C respectively are 3 in. and 2 in. and the sp. gr. of gas = 0·6, the rate of flow is found to be 27,000 c.ft. per hour. What will be the rate of flow when, other conditions remaining unchanged, (1) diameter of pipe = 6 in., (2) gauge pressure at C = 3 in., (3) sp. gr. of gas = 0·48?

2. Make a sketch of a mercury-sealed weight-loaded district governor. If the bell floating in the mercury seal is 24 in. in diameter, and the weight of the bell together with the valves and valve spindle suspended from it is 48 lbs., with what additional weight must the bell be loaded in order that the governor in action shall maintain an outlet pressure of 4 in. water gauge? If, with the governor in equilibrium, the outlet pressure falls one-tenth of an inch water gauge without affecting the inlet pressure, what will be the force tending to open the governor at that instant, and upon what factors will the time taken to re-establish equilibrium depend?

3. Discuss and compare the relative advantages of the various means that may be adopted for reinforcing the supply to districts where the pressure in the mains is tending to fall below the permissible limit during peak loads. In your answer have particular regard (*a*) to the necessity of providing for future increase in gas consumption, and (*b*) to the annual charges incurred in respect to capital and running costs.

4. What do you understand by the term "load factor" as applied to gas distribution problems? Show what bearing it has upon the economics of the industry with special reference to the developments of the last 20 years.

5. The following is an analysis of a mixture of coal and carburetted water gas:

	P.Ct. by Volume.
Carbon dioxide	2·6
Oxygen	0·8
Unsaturated hydrocarbons	2·4
Carbon monoxide	12·7
Hydrogen	46·6
Methane	25·0
Nitrogen	9·9

Give a brief account of the properties of each constituent from the standpoints of gas distribution and utilization. Name the constituents invariably found in town gas that are not included in the analysis, and state their significance in regard to corrosion of pipes.

6. To what do you attribute the great increase in the thermal efficiencies of gas engines in the last forty years? What do you consider should be the thermal efficiency and the mean pressure in the cylinder during the power stroke of a modern gas engine of 50 H.P.? Make a careful sketch of an indicator diagram of a power cycle from a modern gas engine, and show how such a diagram would be affected by (*a*) late ignition, and (*b*) early ignition.

Part II., from 6 to 9 p.m.

(Five questions only to be attempted.)

7. The mantles of a cluster burner in a street lamp are 15 ft. above the ground, and the following table gives the candle-power at various angles corresponding to the horizontal distance from the vertical axis of the lamp along the ground as shown in the first column.

Distance in Ft. from the Lamp.	C.P
0	200
5	280
10	320
20	310
30	280
40	270

Calculate the horizontal illumination at ground-level due to the single lamp at distances of 5 and 30 ft. from its vertical axis.

8. A hall of 60 ft. by 40 ft. by 15 ft. high is to be heated by hot-water radiators. The average temperature is to be maintained at 60° Fahr. (hall empty) with a temperature of air outside of 30° Fahr. Assuming (*a*) the average loss of heat through walls (including windows, &c.) = 15 B.Th.U. per sq.ft. per hour and loss through ceiling and floor can be neglected, (*b*) heat emitted from the radiator = 135 B.Th.U. per sq. ft., (*c*) air changed three times per hour, and (*d*) specific heat of air = 0·02 B.Th.U. per c.ft., calculate the radiator surface required. In what circumstances would gas heating of the circulating water be justified? Specify the type of gas apparatus you would recommend and the maximum rate of gas consumption (500 gas).

9. What precisely do you understand by "smothering" in a gas oven? To what various causes may it be due? Describe and compare methods adopted in two of the latest types of cooker to eliminate the possibility of smothering, while ensuring the highest practicable efficiency.

10. Discuss the relative merits of gas and coke for the provision of hot water for domestic purposes. Contrast the conditions specially favourable to each.

11. Write a complete specification for a pendant and lighting burner for prepayment supplies.

12. If you were asked to arrange for an examination of the consumers' supplies in a residential district, give a full account of the examination you would make with regard to (*a*) safety of installation, (*b*) adequacy of supply under all conditions, and (*c*) suitability and efficiency of appliances.

TESTING GAS METERS IN BIRMINGHAM.

Annual Report of the Official Inspector of Gas Meters.

In his report to the Birmingham City Justices' Gas-Meter Testing Committee for the year ended March 31 last, Mr. Frederick Colburn states that the number of meters tested totalled 126,770, as against 129,683 last year—being a decrease of 2913. The fees charged amounted to £7161—an increase of £28. The expenditure for the year amounted to £3172, showing a credit balance on fees of £3988, which has been carried to the Borough Fund.

Attached to the report are statistical tables giving an analysis of the results of the testings. Of the meters tested, 3774, or 2·97 p.ct., were rejected, as against 3·58 p.ct. last year. Of 9788 wet meters, 479, or 4·8 p.ct., were rejected; and of 116,982 dry meters tested 3295, or 2·8 p.ct., were incorrect. Of the 3774 meters rejected, 1665 were more than 2 p.ct. fast, 886 were more than 3 p.ct. slow, while 598 were rejected for unsoundness—227 external and 371 internal. Of 632 meters submitted for certification, 406, or 64·2 p.ct., were incorrect; 108 were more than 2 p.ct. fast, 25 were more than 3 p.ct. slow, and 59 passed gas without registering, while 91 were leaking internally or passing small quantities of gas without registering. Of the 45,644 new meters submitted, 25,152 were of the standard sizes, as against 17,244 last year. Repaired meters numbered 80,494, or 63·4 p.ct. of the total. The highest monthly percentage of rejections was 4·1, and the lowest 2·5.

During the year, four 10 c.ft. standard holders have been repaired and re-verified *in situ* by the Standards Department, London; the holders being re-stamped and certified as correct measures. The whole of the standards and auxiliary instruments have now been brought up to date.

Preference Stock Issue at Southend.—An issue, by Messrs. A. & W. Richards, of £50,000 of 5¼ p.ct. irredeemable preference stock in the Southend-on-Sea and District Gas Company, is advertised in to-day's issue of the "JOURNAL." The minimum price fixed for tenders is par; and offers must be sent to No. 37, Walbrook, E.C., by Thursday morning, May 21.

Gas at Becontree.—For some time now the "Westminster Gazette" have published articles on modern architecture and building efficiency. In the issue for May 5 was one dealing with the Becontree Estate of the London County Council. On the same page is an advertisement of the Gas Light and Coke Company, in which it is stated that of the 4754 houses at Becontree occupied to date, 4754 are lighted by gas by means of 8739 brackets and 22,425 pendants; 4754 are equipped with gas cookers; 2800 with gas water heaters; and 2270 with gas fires. At Becontree, as elsewhere, gas is proving its value.

CITY AND GUILDS OF LONDON INSTITUTE.

The following questions were set in the City and Guilds of London Institute Examinations in the subjects named.

GAS FITTING.

Chief Examiner: Mr. R. J. Rogers.

Grade II.—*Viva Voce.*

(All questions to be attempted. The maximum number of marks obtainable is affixed to each question.)

1. With how many types of thermostats are you conversant? Are there any conditions under which you would not recommend a thermostat to be fitted to a hot-water apparatus? (*10.*)

2. Supposing that, owing to non-payment of gas account, you have orders to cut-off the supply of gas in a house, but that on calling you are unable to obtain access to the premises, what steps would you take to cut-off the supply, and what would be the procedure before the supply was re-connected? (*10.*)

3. What improvements have been made in modern gas fires to ensure silent burning? (*10.*)

4. Do you, or do you not, recommend a flue pipe to be fitted to the outlet of a gas-cooker oven? State your reasons for or against fitting a flue direct to the outlet of a cooker. (*10.*)

5. How would you test for soundness an installation of gas supply pipes—(*a*) if gas was available; (*b*) if no gas was available? (*10.*)

6. A gas service from main to meter has a defective stopcock inside the building, and you have to replace it with the gas on. How would you proceed to do this? State the precautions necessary. (*10.*)

Grade II.—*Written.*

(The maximum number of marks obtainable is affixed to each question.)

1. Give a sketch of a 6-in. water pressure gauge, and show a pressure equal to 3½ in. of water column registered upon it.

How many inches in water column are equal to 1 in. of mercury? (*50.*)

2. Describe the construction of a gas-steam radiator. Name each part, and explain exactly the steps that you would take in fixing the radiator in order to ensure its efficient working. (*50.*)

3. What are the advantages of a geyser fitted with a safety gas valve over a geyser fitted with interlocking gas and water taps?

Describe one type of safety gas valve fitted to a geyser (*50.*)

4. State the consumption of gas per hour of the following:

(*a*) The boiling burners and grill burner fitted on the hotplate of a modern gas cooker, size of hotplate 24 in. by 20 in.

(*b*) No. 2 size inverted burner.

(*c*) A six-tube double-loop gas-steam radiator—(i.) consumption on first lighting, (ii.) reduced consumption when automatic valve is in operation.

(*d*) An outside lamp fitted with nine No. 2 inverted burners under a superheater.

(*e*) An eleven radiant gas fire. (*40.*)

5. Name the various types of flue pipes fitted to gas appliances. Explain their composition, and state which type you prefer to use, and the reason for your choice. (*40.*)

6. Heat is given off by a gas fire in several ways; what are these? What percentage of each is obtained from a modern type of gas fire? (*40.*)

7. What are the essential features to be observed in fixing: (*a*) A 5-light dry prepayment meter; (*b*) a gas-heated wash boiler; (*c*) a nine radiant gas fire? (*50.*)

8. What is meant by the terms: (*a*) Diffused lighting; (*b*) concentrated lighting; (*c*) semi-indirect lighting; (*d*) indirect lighting?

Show, by sketches, how these various forms of lighting are obtained, and in what circumstances you would recommend their use. (*60.*)

9. State the general defects likely to occur in a 5-light dry prepayment meter after it has been working for a period and explain how they may be remedied. (*40.*)

Grade II.—*Practical Examination.*

1. Examine the geyser, and state to the Examiner the following:

(*a*) How the water travels from the inlet to the outlet pipe.

(*b*) How the products of combustion travel from the burner to the flue outlet.

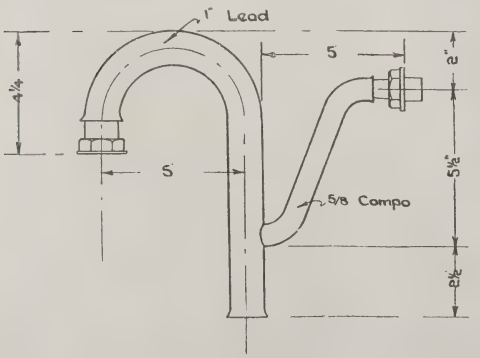


Fig. 1 (Grade II.).

(*c*) The consumption per hour.

(*d*) The size of gas and water supplies necessary to give good results. (*½ hour; 20 marks.*)

2. With the material provided make the lead and compo connection shown in fig. 1. The connection to be complete, with the joints as shown and to the dimensions given. (*1½ hours; 30 marks.*)

3. With the material provided make the control tap connection as shown in fig. 2 to the dimensions given. (*1½ hours; 30 marks.*)

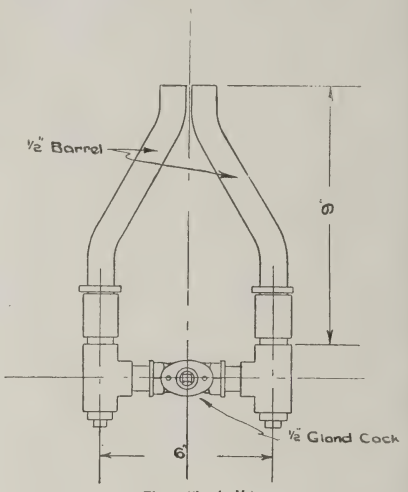


Fig. 2 (Grade II.).

4. Inspect the cooking stove, and explain to the Examiner the following:

(*a*) Consumption of gas per hour of the hotplate burners, also of the oven burners.

(*b*) What you consider should be a good oven temperature, and how long it is before this is obtained after lighting up the oven?

(*c*) The precautions that you would take when fixing the cooker, in order to ensure the maximum efficiency being obtained.

(*d*) Assuming that the oven burners were constantly going out after the oven door was closed, how you would deal with this defect. (*¼ hour; 25 marks.*)

5. Examine the prepayment dry meter and explain to the Examiner:

(*a*) Precisely how the gas passes from the inlet to the outlet.

(*b*) How the coin mechanism operates.

(*c*) What precautions you would take in fixing the meter.

(*d*) Points that would influence your decision in choosing a suitable position for this meter. (*½ hour; 25 marks.*)

6. Inspect the gas fire, and explain to the Examiner:

(*a*) The function of each part.

(*b*) The consumption per hour.

(*c*) The composition of the fuel.

(*d*) The precautions that you would take in fixing it. (*¼ hour; 20 marks.*)

Final Examination.—*Viva Voce.*

(All questions to be attempted. The maximum number of marks obtainable is affixed to each question.)

1. A consumer complains of a generally bad supply of gas to his residence. How would you proceed to ascertain the cause of the complaint? (*10.*)

2. Describe the difference between an open type of geyser and a sealed type of geyser. (*10.*)

3. What in your opinion is the best way of dealing with the condensation tube of a geyser? (*10.*)

4. By what test would you ascertain whether the products of combustion from a gas fire were entering a room? If you found that they were, how would you overcome the difficulty? (*10.*)

5. In what way does a wet meter differ from a dry meter? What precautions are necessary when fixing both in (*a*) a warm position, (*b*) a damp position, (*c*) an exposed position? (*10.*)

6. Can a consumer compel a gas undertaking to give a supply of gas? If so, when and why is he able to do so? (*10.*)

Final Examination.—*Written Paper.*

(Not more than six questions to be attempted. The maximum number of marks obtainable is affixed to each question.)

1. Describe, and show in plan and elevation, a domestic hot water installation suitable for supplying the apparatus shown in the plans on the examination paper.

Ground Floor.—Range boiler, gas heated circulator, and one sink.

First Floor.—One bath, one lavatory basin, and one towel rail.

State the size of boiler, gas circulator, and the consumption per hour, the capacity of the hot water storage tank or cylinder, and the size of the circulation pipes. (*60.*)

2. Give a description of the construction and use of the following: any type of thermostat, antifluctuator, gas leakage indicator, low-pressure service governor. (40.)

3. State briefly the principle upon which a gas engine works, and give (*a*) the consumption per hour when running on full load, (*b*) the size of service and meter that you would instal for a 50-B.P.H. engine, (*c*) common faults that arise from time to time with a gas engine, and how you would remedy such defects. (50.)

4. A consumer is building a house for his own occupation, and you are asked by him to give your reasons why he should use gas in preference to electricity and solid fuel. State fully what your reply would be, indicating the advantages of using gas for (*a*) lighting, (*b*) gas fires, (*c*) wash boiler, (*d*) cooker, (*e*) geyser, (*f*) circulator. (50.)

5. A consumer requires a supply of gas to a hardening furnace. It is necessary for the muffle to be supplied with low-pressure gas in conjunction with a supply of air from a compressor. State (*a*) what would be a suitable ratio in the respective volumes of air and gas, (*b*) the pressure in lbs. per sq.in. of air, (*c*) what, in your opinion, is the best means to adopt to prevent the air passing into the gas supply pipe. (50.)

6. A shop front, 14 ft. wide, is to be lighted by means of outside lamps; the lighting and extinguishing to be operated from inside the shop. State the number and size of lamps you would use, and the method that you would adopt for the lighting and extinguishing of the lamps, also the essential points that a gasfitter should bear in mind when fixing the lamps.

Assuming that the lamps to be used are of the preheated cluster type, state what, in your opinion, are the advantages, or otherwise, of this type. (40.)

7. A garage, 14 ft. long by 10 ft. wide by 9 ft. high, constructed at the side of a dwelling house, is to be heated by means of gas. What form of gas apparatus would you employ for this purpose? Show by means of a sketch where you would fix the apparatus, and state the consumption of gas necessary to maintain a temperature of 50° Fahr. with an outside temperature of 40° Fahr. (40.)

8. A consumer requires a geyser to be fitted capable of delivering 2 gallons of bath water per minute. State (*a*) the consumption of gas per hour for which you would allow, (*b*) the size of gas and water supply that you would instal, assuming the meter to be 50 ft. away, (*c*) the precautions that you would take to ensure the most satisfactory and efficient results.

No flue is available in the bathroom. Show by means of a sketch how you would run the flue pipe from the geyser. (50.)

9. What is meant by the term "thermal efficiency?" What is the thermal efficiency obtained by the use of gas in the following: (*a*) Ring burner on cooker hotplate, (*b*) a gas oven, (*c*) a gas-heated geyser, (*d*) a gas fire? (40.)

FINAL EXAMINATION.—*Practical Tests.*

(*Candidates must attempt all questions.*)

1. Examine the two gas-heated hot-water appliances, and explain to the Examiner for what purpose each is most suited. Further:

(*a*) Give the consumption per hour of each.

(*b*) Explain how each operates.

(*c*) Assuming each has been in use for some time, state precisely how you would overhaul it so as to ensure the most efficient results.

(*d*) Explain how the thermostat operates.

(¼ *hour; 20 marks.*)

2. With the material provided make the lead connection as shown in fig. 1 to the dimensions given; joints to be blow in. (1½ *hours; 30 marks.*)

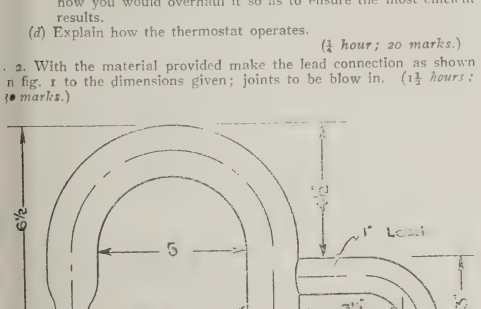


Fig. 1 (Final).

3. Examine the two appliances given you by the Examiner. State what these are, precisely how they act when in operation, and in what circumstances you would recommend them to be installed. Give fully your reasons. (¼ *hour; 20 marks.*)

4. With the 1-in. steam quality barrel make the steam radiator connection, complete with flanged joint, to the dimensions given in fig. 2. (1½ *hours; 30 marks.*)

5. Inspect the sketch plan fig. 3 on the plate attached to this paper, which shows an underground meter chamber ready to accommodate a 1000-light cylindrical meter. Explain to the Examiner (*a*) the method that you would adopt to lower the meter to the bed and the precaution that you would take to prevent possible damage, (*b*) step by step how you would fix the meter, (*c*) the size of service

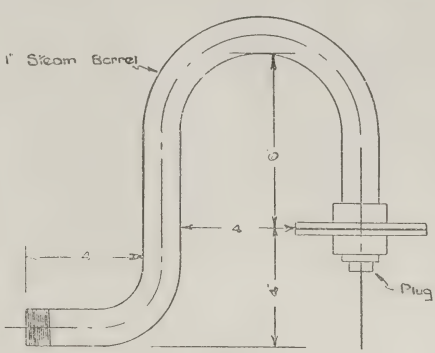


Fig. 2 (Final).

to the inlet, and the size of by-pass that you would fix. (¼ *hour; 25 marks.*)

6. With the material provided connect up the tinman's low-pressure soldering-iron stove; also connect up the pressure gauge. Explain to the Examiner (*a*) the consumption per hour of the stove, (*b*) the advantage of this type of stove over solid fuel, (*c*) read off the pressure on the gauge. (¾ *hour; 25 marks.*)

COAL-TAR DISTILLATION AND CRUDE INTERMEDIATE PRODUCTS.

Chief Examiner: Mr. W. H. COLEMAN.

FINAL EXAMINATION.—*Written.*

(*Not more than six questions to be attempted. The maximum number obtainable is the same for each question.*)

1. Describe, with sketches, what you consider to be the best arrangement of a modern intermittent tar still, with preheater and other necessary adjuncts.

2. Give some account of the manufacture, properties, and uses of *either* the hydrogenated *or* the chlorinated derivatives of naphthalene.

3. Describe, with sketches, the process and plant used in manufacturing pure benzole from crude naphtha or light oil.

4. Describe the manufacture of 60's carbolic acid. Define the term "60's carbolic acid" and describe the method of testing this acid.

5. Give a specification for creosote oil suitable for preserving timber, and describe the process of using it for this purpose.

6. How is pyridine suitable for denaturing alcohol made? Give an account of the properties and uses of pyridine.

7. Describe fully the manufacture of sulphate of ammonia from gas liquor; state for what purposes it is used; and describe the method of testing it.

8. State to what special hazards the workmen in tar works are exposed, and how they can be lessened.

FINAL EXAMINATION.—*Practical.*

(*All the questions may be attempted if time allows, but full marks can be obtained from* THREE *satisfactory answers. The maximum number of marks obtainable is the same for each question.*)

1. Examine the sample of pyridine marked A, and state your opinion of its quality.

2. Test the sample of motor benzole marked B, and state your opinion of its quality.

3. Determine the percentage of ammonia and of free acid in the sample of sulphate of ammonia marked C.

4. What is sample D? Examine it in the usual way, and state your opinion of its quality.

COKE AND BYE-PRODUCTS MANUFACTURE.

Examiner: Mr. C. P. FINN, B.Sc., F.I.C.

FINAL.

(*Not more than eight questions to be attempted. The maximum number of marks obtainable is affixed to each question.*)

1. Describe, with the aid of neat sketches, a modern type of coal washer to deal with rough slack of size 2 in. downward. (35.)

2. Discuss the composition and properties of the various types of refractory materials used in coke-oven construction, and indicate the suitability of each variety for any particular purpose. (40.)

3. If you were designing a new coking plant, what methods of quenching and handling coke would you prefer? Describe your scheme (using sketches), and give the reason for your choice. (40.)

4. Discuss the physical and chemical properties of coke, and their bearing on the iron industry. (35.)

5. Give your views (with suitable sketches) as to an installation to deal with the distillation of 400 tons of tar monthly. (35.)

6. Illustrating your answer by means of diagrams, describe any two of the following:

(*a*) A gas meter for combustion of coke-oven gas under boilers.

(*b*) A meter for the measurement of crude coke-oven gas.

(*c*) A pyrometer for the use of foremen and gas regulators.

(*d*) Some type of gas calorimeter. (40.)

7. Enumerate the principal points by attention to which you would secure a practical maximum of economy in the heating of a battery of coke ovens. (45.)

8. Give a detailed account of *one* of the following determinations:
(*a*) The efficiency of a benzole scrubbing plant.
(*b*) The value of a sample of sulphate of ammonia. (35.)
9. Set forth the considerations which would influence your choice of any particular type of ammonia recovery plant. (40.)
10. Write a short essay on any *one* of the following topics:
(*a*) Recent developments in coke-oven design.
(*b*) Suggested new processes of benzole recovery.
(*c*) Labour-saving devices on modern plants.
(*d*) Low-temperature carbonization. (45.)

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

There is no change to report in the situation, except the general cumulative effect of continued lack of trade. The market closed for the week under dull and depressing conditions, with a lamentable lack of general inquiry.

Gas coals continue idle and uninteresting, and new business is extremely scarce, with keen competition for any stray orders which come along. Second-class qualities are weaker, and, while the general nominal quotation remains at about 17s., business has been reported in some brands as low as 16s. Wear Specials and best qualities are nominally 19s. 6d., but most brands can be obtained at 19s. f.o.b., and possibly even less for prompt and convenient tonnage.

Other Durham unscreened sorts are in no better plight. The demand for coking is very poor, and best makes are only 17s. to 17s. 3d. Bunker orders are keenly competed for, and best makes are about 17s. 9d. to 18s.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

Gas coals in Yorkshire and Lancashire are quieter in demand for immediate delivery, and forward contracts have been fixed rather earlier this year. Prices generally are 2s. per ton below those of last year.

The recent cold weather has had a steadying effect on the demand for household fuel, and although some producers have reduced their prices slightly, others, in a more favourable position, are maintaining their winter figures.

The industrial outlook appears to have slightly improved, possibly owing to the fact that the irregular working of collieries will cause certain required descriptions of coal to become scarcer than they are at the moment. The commoner grades are still being offered at low figures; but these are not being taken advantage of to any great extent.

The shipping trade continues dull; but there is a hope that a better situation will obtain when producers are compelled to put their products on the market at prices which will compete with those of the nearer Continental coals.

Prices at Hull at the week-end were: South Yorks.—Hards, Association, 20s. to 21s.; screened gas coal, 18s. 9d.; washed trebles, 20s.; washed doubles, 17s. 6d. to 18s. 1½d.; washed singles, 16s. 9d.; washed smalls, 12s. 6d. to 12s. 9d.; unwashed doubles, 16s. 6d.; rough slack, 10s. 9d. to 12s. 6d.; smithy peas, 19s. 3d. to 20s. 6d. West Yorks.—Hartleys, 17s. to 18s.; screened gas coal, 18s.; washed trebles, 18s. 6d.; washed doubles, 16s. 6d. to 17s.; washed singles, 16s. 6d.; washed smalls, 11s.; unwashed trebles, 17s. to 17s. 6d.; unwashed doubles, 13s. to 13s. 6d.; rough slack, 10s. 6d.; coking smalls, 9s. Derbyshire and Notts.—Top hards, 19s. 3d. to 21s.; washed trebles, 17s. 6d.; washed doubles, 17s.; washed singles, 16s. to 16s. 6d.; washed smalls, 12s.; unwashed doubles, 14s. to 15s.; rough slack, 10s. 6d. to 11s. Yorks., Derbyshire, and Notts.—Screened steam coal, 15s. to 17s.; gas coke, 21s. 6d. to 24s.; furnace coke, 16s. 6d. per ton.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

While in its broader aspects the market could hardly be worse, some of the collieries manage to find a fairly steady outlet for their production without curtailing the working week by more than a day or so. This can only be said, however, of those undertakings which, from their geographical position, have the first pull on the markets, and are not greatly susceptible to the competition of districts where supply has outrun absorptive capacity. At the best pits of Cannock Chase and the Warwickshire coalfield a fair amount of regularity is maintained. Elsewhere in the Midlands, collieries which have special economic advantages are making a fair turnover; but more generally the industry is in a sore plight. Prices are very unstable, the unbalanced production of different grades of fuel, owing to the inconstancy of demand, being a very difficult problem. Spot lots are forced on to the market in increasing bulk and numbers. There is no alternative in many cases but to accept the best prices that can be got, so that the position is becoming more demoralized.

Weather conditions have given a slight stimulus to the call for the best grades of house coal. In some cases there is a delay of two or three weeks in getting delivery, but these are quite exceptional and of purely local significance. Steams and other industrial coals are plentiful and cheap. D.S. nuts and beans are in very ample supply. There is again a glut of slacks, and spot lots are offered at lower rates.

Coke is weak, without quotable change. Two North Lincolnshire blast-furnaces are being re-started for the service of the Scottish tube and plate trade; but the new pig iron production will involve displacements elsewhere, as there is no expansion of consumptive requirements.

CURRENT SALES OF GAS PRODUCTS

The London Market for Tar, Tar Products, and Sulphate.

London, *May* 11.

The market for pitch remains unaltered, the price continuing nominal at 41s. to 42s. per ton at makers' works.

Considerable quantities of tar are being delivered for road work.

Creosote is quiet, and the price is unchanged at about 7d. per gallon net and naked at makers' works.

Solvent naphtha, 95/160, is firm at about 1s. 8d. per gallon.

Pure benzole and pure toluole are unaltered at about 1s. 10d. per gallon.

Tar Products in the Provinces.

May 11.

The average values for gas-works products during last week were: Gas-works coal-tar, 27s. 9d. to 32s. 9d. Pitch, East Coast, 40s. to 41s. f.o.b. West Coast—Manchester, 35s. to 36s.; Liverpool, 36s. to 37s.; Clyde, 39s. to 40s.; Benzole, 90 p.ct., North, 1s. 7½d. to 1s. 8¼d.; crude, 65 p.ct., at 120° C., 11d. to 1s. 1d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 7½d. to 1s. 8¼d. Toluole, naked, North, 1s. 6¾d. to 1s. 7¼d., nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8¼d. Solvent naphtha, naked, North, 1s. 5d. to 1s. 6d. Heavy naphtha, North, 1s. to 1s. 2d. Creosote, in bulk, North, liquid, 6d. to 6¼d.; salty, 5⅝d. to 6¼d.; Scotland, 5⅝d. to 6d. Heavy oils, in bulk, North, 6¼d. to 7d. Carbolic acid, 1s. 5d. to 1s. 6d. prompt. Naphthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality 2½d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

[We regret that the quotation for salty creosote was given last week as 5⅝d. to 6¼d. This should have been 5⅝d. to 6¼d.]

Manchester District Tar Prices.

The average prices realized for the sale of tar, according to the sliding scale, for the months of February and March, were £2 12s. 7·46d. and £2 9s. 3·19d. respectively.

TRADE NOTES.

The Anglo-Galvanizing Company, Ltd.

This firm have published a booklet giving details in reference to their process of cold galvanizing (the Bianco process). It is stated that the coating of zinc is perfectly smooth, homogeneous, and compact, and the resistance to corrosion is higher than the coating by the hot method.

Safe Working of Air Compressors.

The notes on this subject compiled in a booklet recently issued by the "Monitor" Patent Safety Devices, of Wallsend-on-Tyne, will prove of value to those in charge of air compressors. Any reader of the "Journal" who is in charge of power plant may have a free copy of this booklet on application to the firm.

Messrs. Clayton, Son, & Co., Ltd.

This firm have received an order from the Windsor Royal Gaslight Company for one of their cascade tar dehydration plants having a capacity of 10 tons per day. A similar plant was recently dispatched to the order of the Municipality of Singapore Gas Department, and another cascade plant has just been put into operation for the Borough of Peebles Gas Department.

CONTRACTS OPEN.

Coal.

The Skipton Urban District Council are inviting tenders for the supply of 10,000 tons of gas coal. [See advert. on p. 486.]

The Gas Committee of the Corporation of Workington are inviting tenders for the supply of 9000 tons of gas coal. [See advert. on p. 487.]

Tenders are invited by the Melton Regis Urban District Council for the supply of 2500 tons of unscreened best gas coal. [See advert. on p. 486.]

The Gas Committee of the Ashbourne Urban District Council are inviting tenders for the supply of 4000 tons, or part thereof, of best screened gas coal and washed gas nuts. [See advert. on p. 487.]

Tar.

The Directors of the Littlehampton Gas Company are inviting tenders for the purchase of their surplus crude coal tar for the year ending June 30, 1926. [See advert. on p. 486.]

EXTENSIONS.

Extensions at Blackburn.

The Blackburn Corporation Gas Committee have received formal sanction from the Ministry of Health to borrow £60,000 for the provision of a gasholder and renewal of oil gas plant. The Corporation will receive a grant in aid from the Unemployment Grants Committee.

Ramsey Gas Company and Electrical Powers.—A lengthy discussion took place at a recent special meeting of the Ramsey (Isle of Man) Town Commissioners with regard to a proposal by them to promote a municipal scheme for the supply of electricity, and to oppose the application of the Ramsey Gas Company to obtain powers to do so. A number of business men in the town presented a petition urging the Commissioners not to proceed with the municipal scheme, on the ground that it was of a speculative character. However, by seven votes to five the Commissioners adopted a resolution that they should oppose the Gas Company's application for powers to instal an electric supply, and should proceed with their own scheme.

Explosion at Belper Gas-Works.—When a purifier was being opened at the Belper Gas-Works, which belong to the Derby Gas Light and Coke Company, an explosion occurred which resulted in slight injury to seven men.

Garforth Collieries, Ltd.—We are informed that the Registered Office of the Garforth Collieries, Ltd., has been transferred to the Offices of the Old Silkstone Collieries, Ltd., Dodworth, near Barnsley. The secretaryship has been taken over by Mr. S. P. Harrison.

Dukinfield Gas Balance-Sheet.—The balance-sheet of the Borough of Dukinfield Gas Department for the year ended March 31 states that the sale of gas amounted to nearly 96 million c.ft., which was an increase on the previous year of 5¾ millions. There was a gross profit on the year's working of £4071, and a net loss of £300. The average price of gas, however, was 3s. 6·52d. per 1000 c.ft., as compared with 4s. 1·33d. for the preceding twelve months.

New Issues Over-Subscribed.—The Tottenham District Light, Heat, and Power Company's recent issue of 5¾ p.ct. preference stock was largely over-subscribed. No tender below £102 5s. p.ct. was successful, and the average price of the tenders accepted was £102 6s. 10d. p.ct. The issue of £8000 of 6¼ p.ct. irredeemable preference stock of the Wells Gas Light Company was also considerably over-subscribed; the prices ranging from £105 per £100 stock to par.

Hyde Exhibition.—The Hyde Gas Company are to be congratulated upon the organization of a very excellent exhibition, which has just concluded at the Town Hall, Hyde. Opened on May 4 by Mr. G. F. Drinkwater (the Chairman of the Company), the exhibition continued to attract large crowds for the whole of the five days during which it was open. The cookery lectures and demonstrations held each afternoon and evening created considerable interest, and were well attended. The very comprehensive display of gas apparatus on show was supplied by Messrs. W. H. Dean & Son, Ltd., Messrs. Fletcher, Russell, & Co., Ltd., General Gas Appliances, Ltd., the Richmond Gas Stove and Meter Company, Ltd., and Messrs. John Wright & Co.

Manchester Gas Department.—The financial statement of the Manchester Corporation Gas Department for the past year, with the estimates for the current year, were approved at a meeting held on May 1. It was announced that, notwithstanding the extraordinary increase in the sale of gas during the previous year, demand was still well maintained, and a further increase had been realized. The output for the twelve months was 7,218,369 c.ft., against 7,136,192 c.ft. last year. The income for the year amounted to £1,400,647, against an expenditure of £1,253,694. After the deduction of £90,457 on account of interest on loans, there remained a net profit on the year's working of £56,496, which had been applied to the sinking fund for the redemption of loan debt. The estimated profit on the current year's trading was put at £42,961.

Guest, Keen, and Piggotts.—A Company, with a capital of £40,000, has been registered to adopt an agreement between Guest, Keen, & Nettlefolds, Ltd., and Thomas Piggott & Co., Ltd., and to carry on the business of manufacturers of mains, pipes, conduits, &c., and vessels of all kinds for conveying, transmitting, storing, measuring, and otherwise utilizing water, gas, oil, and electricity, manufacturers and drawers of tubes and pipes, &c.

Manchester Meter Testing.—Mr. A. Winterbottom (Official Inspector of Gas Meters for the City of Manchester) has submitted to the Justices of the Peace his annual report for the year ended March 31. The number of meters tested during the year amounted to 60,673, showing an increase of 8146 as compared with the previous year. The fees charged totalled £3345. The number of meters tested is the highest on record. The expenditure amounted to £2711, showing a credit balance of £705. Of the meters tested, 2455 were rejected, or 4·04 p.ct. Of the total wet meters tested—viz., 4886—309, or 6·3 p.ct., were rejected; and of 55,787 dry meters tested, 2146, or 3·8 p.ct., were rejected. The number of prepayment meters tested during the year was 35,014. Standard meters numbered 10,929; the remaining 14,730 being meters of the ordinary type.

Good Gas Sales at Accrington.—Addressing the Accrington District Gas Board, on April 30, the Chairman (Alderman D. C. Dewhurst) said it was too early to forecast the financial results of the year, but gas sales were booming. The production had increased by 27 million c.ft. over last year (an increase of more than 40 p.ct. since 1919). This did not look as though they were "flogging a dead horse" in gas, as someone declared a little time ago. They had fixed 1600 gas cookers, fires, and boilers during the year; and this work was still going on. Gas was being used more than ever in industry and in domestic life. They were working hard to improve the distributing system, and many miles of new pipes had been laid. They had taken from slot meters £45,428, or 101 tons of copper. They had added nearly 400 consumers to their books.

Returns for the Chorley gas undertaking show that during the last municipal year 3,277,000 c.ft. more gas were consumed than in the previous year. In March alone there was an increased consumption of 624,000 c.ft.

Summer courses arranged for students of the Bradford Municipal Technical College include lecture courses and laboratory classes in gas analysis, analysis of coal and coke, and demonstrations in boiler-house practice, with special attention to elimination of the smoke nuisance.

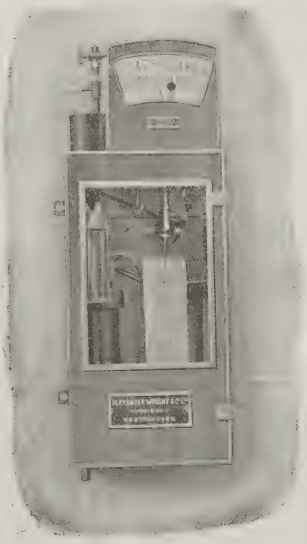
The Buxton Town Council have considered a letter from the Ministry of Agriculture and Fisheries, together with a report from Mr. J. Race, giving the results of his analysis of the various liquids which enter the River Wye from the gas-works. The Gas Engineer was instructed to carry out the suggestions made by Mr. Race to stop the pollution of the river.

CARBON DI-OXIDE RECORDED BY ACTUAL MEASUREMENT.

THE "S.A.W." CO_2 RECORDER

(SIMMANCE, ABADY, & WOOD'S PATENT)

makes a definite volumetric analysis of a gas sample drawn from a continuously moving stream. ERRORS due to gravity, osmotic pressure, humidity, &c., are consequently avoided. ACCURATE readings are obtained under all conditions of pressure or draught as there is no empirical scale.



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STOCK MARKET REPORT.

ALTHOUGH markets did not respond to the extent expected to the reduction in income-tax, stockbrokers report that business shows a steady improvement. The restoration of the gold standard, involving a general overhaul of investments by large holders, was partly responsible for the activity; but in addition there was a distinct increase in the number of inquiries for all classes of shares.

No material changes occurred in gilt-edged stocks, and Railways continued dull. There were some interesting features, however, in the Industrial market. Courtaulds, after the previous week's fiasco, were actually sold down to 92s. 6d., rising later to 94s. 6d.

It will be seen by the record below that there was an increase in the number of transactions recorded in the Gas Market. Holders of South Metropolitan stock are to be congratulated on the result of the Company's application to Parliament. It is reported that the Select Committee of the House decided last week that the basic rate of 11d. per therm —*i.e.*, the price at which gas can be sold to authorize a minimum dividend of 5 p.c. to be paid—is justified at present, subject to a revision in ten years' time. This freedom from interference for such a long period will be of great value to the Company. The ordinary stock of the Company now stands at 93-95, there being a fall of 1 point on the week; but the depreciation has not been so heavy as on the stock of the other Metropolitan Companies. Excepting Liverpool 5 p.ct. ordinary, which rose 2 points to 89-90, all the changes during the week on the ordinary stocks were again on the downward side.

The following transactions were recorded during the week:

On Monday, Bournemouth 5 p.ct. 12¾. Brentford "A" 95, Commercial 4 p.ct. 87, Continental Union 35¼, 7 p.ct. preference 88, Gas Light and Coke 84¼, 84⅜, 84¼, 84⅜, 85, 85⅛, 3½ p.ct. maximum 63¾, 64, 64⅜, 4 p.ct. preference 79, 3 p.ct. debenture 60½, Hong-kong and China 17, Imperial Continental 180⅝, Montevideo 66, Primitiva 10s. 3d., 10s. 6d., South Metropolitan 93¼, 93⅜, 94, 94¼. Supplementary prices, Aldershot 5 p.ct. "A" 81½, Dover 5¼ p.ct. debenture 102⅜.

On Tuesday, Alliance and Dublin 66, Brentford "B" 95, Croydon sliding-scale 100, Gas Light and Coke 83½, 83⅜, 84, 84⅛, 84⅜, 3½ p.ct. maximum 64, 4 p.ct. preference 79, 79½, Hastings and St. Leonards 3½ p.ct. 75, Hornsey 137½, 138, Imperial Continental 181½, 182, 3½ p.ct. debenture 73, 73½, Lea Bridge 99⅝, 100, Liverpool 7 p.ct. preference 105, Portsea Island "C" 97, Primitiva 9s. 9d., 10s., 4 p.ct. debenture (1911) 63⅜, South Metropolitan 93⅜, ¾ p.ct. debenture 61½, Southampton 84, 84½, Tottenham "B" 98, 98½, 99. Supplementary prices, Brighton and Hove 4 p.ct. debenture 70, Portsea Island 4 p.ct. debenture 73.

On Wednesday, Aldershot 4 p.ct. preference 71, 71½, Alliance and Dublin 66⅜, 67⅛, Brentford "A" 95, "B" 95, 6 p.ct. Richmond debenture 104, 104½, 104⅜, Commercial 4 p.ct. 86½, Croydon sliding-scale 100½, Gas Light and Coke 83⅜, 84¼, 84⅜, 84½, 3½ p.ct. maximum 64, 4 p.ct. preference 79, Imperial Continental 182, Liverpool 7 p.ct. preference 104½, Montevideo 65, Primitiva 9s. 6d., 9s. 9d., 10s., 10s. 3d., 4 p.ct. debenture (1911) 64¼, South Metropolitan 93, 93⅛, 94¼, South Suburban 5 p.ct. 97½, Southampton 84½, Tottenham "B" 97. Supplementary prices, Danish 80s., 82s. 6d., 83s. 1¾d., 5 p.ct. preference 5½, Malta and Mediterranean 1st 7 p.ct. preference 5⅝, North Middlesex 4 p.ct. debenture 79½.

On Thursday, Bombay 5 *ex* div., Brentford "A" 95, "B" 95, 5 p.ct. preference 96, British 111, Commercial 4 p.ct. 86¼, 3½ p.ct. 86¼, 3 p.ct. debenture 58, European 7, Gas Light and Coke 83½, 83⅜, 84, 84½, 84¼, 84½, 4 p.ct. preference 79½, Imperial Continental 181, Montevideo 65½, Oriental 105 *ex* div., Primitiva 9s. 9d., San Paulo 5 p.ct. debentures 43¾, South Metropolitan 93½, 93⅜, 94, 94¼, Swansea 7 p.ct. preference 102½, 103. Supplementary prices, Brighton and Hove 7 p.ct. debenture (1930) 106, Danish 80s. 7½d., 5 p.ct. preference 5⅝, Malta and Mediterranean 1st (7 p.ct. preference) 5¾, 2nd (7½ p.ct. preference) 5½, Southend-on-Sea 5 p.ct. new "B" 88, 88½, Tottenham 7½ p.ct. mortgages, 1931-5, 105, York Town and Blackwater 7 p.ct. add. ordinary 10½.

On Friday, Alliance and Dublin 66⅛, Bombay 5 1/16 *ex* div., Brentford "A" 95, 95¼, Continental Union 7 p.ct. preference 91, Gas Light and Coke 83½, 83⅜, 84, 84½, 3½ p.ct. maximum 63⅜, 4 p.ct. preference 79, Maidstone 5 p.ct. 125, 125⅜, Primitiva 9s. 7½d., South Metropolitan 93½, 93⅜, 94, 6½ p.ct. debenture 103½, Tottenham "A" 117, Wandsworth 3 p.ct. debenture 59. Supplementary prices, Malta and Mediterranean 2nd (7½ p.ct. preference) 5½, 5¾, Tottenham 5½ p.ct. preference 104½.

There was a shortage of money in Lombard Street last week on account of the payment of the final instalment of about £11,000,000 on the 3½ p.ct. Conversion Loan, and borrowers had to pay as much as 5¼ p.ct. for fresh overnight money, although 4½ to 4⅜ p.ct. was the usual rate. Treasury Bills consequently commanded a higher average rate—£4 10s. 6·29d.

The Foreign Exchange Market was quiet, but generally rates moved against this country. Sterling rate closed at 4.84⅜, French francs at 92.07½, Belgian francs at 96.02½, and Italian lire at 118.10.

Silver was quiet at 31½d. per oz., and gold was unchanged at 84s. 11½d. per oz.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on March 5. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3¼ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.-Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. May 8.	Rise + or Fall − on Week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 5	5	5	Aldershot 5 p.c. max. C. .	78–81	..	..
295,492	,,	,,	4	4	Do. 4 p.c. Pref. . .	71–76	..	71–71½
1,551,868	,,	Apl. 2	6½	6½	Alliance & Dublin Ord. .	66–71	..	66–67⅛
374,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb. . .	63–68	..	..
300,000	5	May 7	8	8	Bombay, Ltd.	4⅞–5⅛*	−⅛	5–5 1/16
170,000	10	Mar. 5	8½	8½	Bournemouth 5 p.c. . .	12–13	..	12½
425,050	10	,,	7	7	Do. B 7 p.c.. .	12½–12½	..	..
150,000	10	,,	6	6	Do. Pref. 6 p.c.. .	11–12	..	..
50,000	Stk.	Jan. 8	3	3	Do. 3 p.c. Deb..	56–59	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb..	76–79	..	..
992,045	,,	Mar. 5	6 3/16	6 3/16	Brentford A Con. . . .	95–105	..	95–95¼
990,500	,,	,,	6¼	6¼	Do. B New	95–105	..	95
76,000	,,	,,	5	5	Do. 5 p.c. Pref. . .	95–98	..	96
306,699	,,	Dec. 18	4	4	Do. 4 p.c. Deb. . .	76–81	..	..
181,337	,,	,,	6	6	Do. 6 p.c. Rich. Red. Deb.	100–105	..	104–104⅛
214,740	,,	Mar. 5	11¼	12½	Brighton & Hove Orig. .	165–170	..	..
244,200	,,	,,	8¼	9½	Do. A Ord. .	122–125	..	..
1,287,500	,,	Feb. 19	5	5	Bristol 5 p.c. max. . . .	96½–97¼a	..	..
855,000	,,	Mar. 5	8	7	British Ord.	110–115	..	111
100,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref. . .	123–128	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. .	72–77	..	..
100,000	10	Dec. 18	8	6	Cape Town, Ltd.	7–8	..	..
100,000	10	Apl. 23	4½	4½	Do. 4½ p.c. Pref.. .	6–7*	..	..
150,000	Stk.	Dec. 18	4½	4½	Do. 4½ p.c. Deb.. .	71–76	..	..
626,860	,,	Feb. 19	6	6	Cardiff Con. Ord. . . .	101–104	..	..
237,860	,,	Jan. 8	7½	7½	Do. 7½ p.c. Red. Deb. .	104–107	..	..
157,150	,,	Feb. 19	5	6½	Chester 5 p.c. Ord. . . .	89½–94½b	..	..
1,513,280	,,	Mar. 5	6	5/11/8	Commercial 4 p.c. Cap. .	86–89	..	86½–87
560,000	,,	,,	6	5⅜	Do. 3½ p.c. Cap. .	86–89	..	86½
475,000	,,	Dec. 18	3	3	Do. 3 p.c. Deb. .	57–60	..	58
800,000	,,	14 Jan. 15	—	—	Continental Union, Ltd. .	35–40	..	35½
200,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref. . .	88–92	..	88–91
660,000	,,	Mar. 5	6½	6½	Croydon sliding scale . .	98–102	..	100–100½
284,975	,,	,,	5	5	Do. max. div. . . .	83–86	..	..
692,270	,,	Feb. 19	6	9	Derby Con.	110–112c	..	..
55,000	,,	Jan. 8	4	4	Do. Deb.	74–76c	..	..
1,002,180	I	Jan. 22	6	4	European, Ltd.	7	..	7
16,460,070	Stk	Feb. 19	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	83½–84⅛	−⅛	83½–85⅛
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max. .	62–65	..	63½–64⅝
4,662,235	,,	,,	4	4	Do. 4 p.c. Con. Pref.	78–80	..	79–79½
4,761,930	,,	Dec. 18	3	3	Do. 3 p.c. Con. Deb.	59–62	..	60½
130,000	,,	—	10	10	Do. 10 p.c. Bonds . .	..	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Mar. 19	6½	6½	Hastings & St. L. 5 p.c. Conv.	92–97	..	..
258,740	,,	,,	5¼	5¼	Do. 3½ p.c. Conv.	73–78	..	75
70,000	10	May 7	10	10	Hongkong & China, Ltd. .	15½–16½*	−½	17
86,600	Stk.	Mar. 5	10	10	Hornsey 7 p.c.	135–141	−2	137½–138
1,976,000	,,	Nov. 20	30	10	Imperial Continental Cap. .	179–184	..	180½–182
263,950	,,	Feb. 5	3½	3½	Do. 3½ p.c. Red. Deb.	71–74	..	73–73½
233,242	,,	Mar. 19	6½	6½	Lea Bridge 5 p.c. Ord.. .	96–101	..	99⅝–100
1,127,340	,,	Feb. 19	5¼	5¼	Liverpool 5 p.c. Ord. . .	89–90§	+2	..
600,000	,,	Mar. 19	7	7	Do. 4 p.c. Pref. . .	103½–104½b	..	104½–105
165,736	,,	Feb. 19	9	8	Maidstone 5 p.c. Cap. . .	122–132	..	125–125⅜
63,480	,,	Dec. 18	3	3	Do. 3 p.c. Deb.. .	54–59	..	..
75,000	5	Dec. 4	7	5	Malta & Mediterranean .	4¼–4⅜	..	..
541,920	Stk.	Nov. 20	4	4	Montevideo, Ltd.	62–67	..	65–66
2,061,315	,,	Mar. 5	5	5	Newcastle & Gateshead Con.	77¼–78d	−1¼	77⅛–78
300,929	,,	,,	4	4	Do. 4 p.c. Pref. .	72–73½d	..	..
529,705	,,	Dec. 18	3½	3½	Do. 3½ p.c. Deb. .	68½–69½d	..	..
15,000	,,	Mar. 5	11	12	North Middlesex 10 p.c. .	..	..	..
75,940	,,	,,	7 7/16	8⅜	Do. 7 p.c. . . .	..	..	..
300,000	Stk.	May 7	9	7	Oriental, Ltd.	100–105*	−2	105
188,120	,,	Jan. 8	7⅛	7½	Plym'th & Ston'house 5 p.c.	109–114	..	..
60,000	50	Mar. 5	13	14	Portsea Island B . . .	96–99	..	..
100,000	50	,,	12	13	Do. C	93–98	..	97
2,289,909	I	,,	—	—	Primitiva Ord.	9/6–10/6	− /3	9/6–10/6
311,100	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb..	79–81	..	..
600,000	Stk.	Jan. 22	4	4	Do. 4 p.c. Red. Deb. 1911	63–65	..	63¾–64¼
220,335	,,	Dec. 18	4	4	Do. B. Aires 4 p.c. Rd. Db.	65–67	..	..
321,670	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	65–67	..	..
150,000	10	Mar. 19	6	6	San Paulo 6 p.c. Pref. . .	7⅞–8¼	..	..
125,000	50	Jan. 2	5	5	Do. 5 p.c. Red. Deb.	43–46	..	43¾
270,000	Stk.	Mar. 19	5¼	5¼	Sheffield A	103–105e	..	..
419,968	,,	,,	5¼	5¼	Do. B	103–105e	..	..
1,747,000	,,	,,	5¼	5¼	Do. C	103–105e	..	..
90,000	10	Oct. 23	8	6	South African	7–9	..	..
6,609,895	Stk.	Feb. 19	5	5	South Met. Ord.	93–95	−1	93–94⅛
1,995,445	,,	Jan. 8	3	3	Do. 3 p.c. Deb. .	59–62	..	61½
734,000	,,	Mar. 5	6¼	6¼	Do. 6¼ p.c. Red. Deb.	102¾–104⅛	..	103⅛
91,500	,,	Mar. 5	8¼	8¼	South Shields Con. . . .	135–136d	..	..
1,187,795	,,	Feb. 19	6¾	6¾	South Suburban Ord. 5 p.c.	97–102	..	97½
368,837	,,	Dec. 18	5	5	Do. 3 p.c. Deb.	97–100	..	..
647,740	,,	May 7	5	5	South'mpt'n Ord. 5 p.c. max.	81–84*	−2	81–84⅛
121,275	,,	Dec. 18	4	4	Do. 4 p.c. Deb. .	75–77	..	..
250,000	,,	Mar. 5	7	7	Swansea 7 p.c. Red. Pref. .	101½–103½	..	103½–103
200,000	,,	Dec. 18	6¼	6¼	Do. 6½ p.c. Red. Deb. .	103–105	..	..
120,000	,,	Feb. 19	8	8	Tottenham District A 5 p.c.	116–119	..	117
882,275	,,	,,	6¾	6¾	Do. B 3½ p.c.	97–100	−1	97–99
181,255	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	77–80	+¼	..
258,251	,,	Mar. 19	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, & Wycombe 5 p.c.. .	77–79d	..	..
197,294	,,	Feb. 19	6¾	6¾	Do. 5 p.c. pref. .	100–105	..	..
88,330	,,	,,	5	5	Do. 5 p.c. Maidenh'd	95–100	..	..
91,800	,,	,,	—	6¾	Do. 5 p.c. Red. Deb.	90–95	..	..
30,000	,,	Mar. 5	9¼	9¼	Wandsworth and Epsom— Wandsworth A 5 p.c. .	130–135	..	..
255,636	,,	,,	7¼	7¼	Do. B 3½ p.c. .	110–115	..	..
392,955	,,	,,	6/9/6	6/9/6	Do. C and New .	95–100	..	..
352,000	,,	,,	7⅜	7⅜	Wimbledon 5 p.c. . . .	105–110	..	..
98,000	,,	,,	7⅜	7¼	Epsom 5 p.c..	115–120	..	..
88,416	,,	Dec. 18	3	3	3 p.c. Deb.	57–00	..	59

Quotations at :—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. * Ex. div.

GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

(Founded in 1849 as the "Journal of Gas Lighting.")

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EDITORIAL NOTES.

The Gas Exhibit.

IPHASIS may be placed on "The" in the above title, be-ıse the Exhibit is—good as was that of last year—the ;t thing of the kind that has been done. A visit to embley at the end of last week satisfied us on that score. .d we came away strongly impressed with the fact that is the most imposing feature in the Palace of Industry, :ause of the attractiveness, from the popular point of :w, that met our gaze and scrutiny at every turn. was one of the glorious sunlit days that were ex-rienced last week, when the world was full of life, and ople were taking a keen interest in what was going on out them—interest quickened by light and brightness. nshine adds greatly to the glories of Wembley, and is a tent excitant to the desire to share fully in the interest d pleasure offered there with such lavish hand. And y by day last week more people journeyed to Wembley an on the corresponding days of last year immediately ceeding the opening. All concerned in obtaining, and ıging for, a full measure of success in its mission to the ·itish Empire Exhibition are devoutly trusting that Old ıl will comply with the wishes of the people, and not be niggardly as he was last year in ministering to their ppiness.

Those who have devised and brought to the point of mpletion the Gas Exhibit know well how much bright-ss and life contribute to the attraction of the public. And ightness and life are there in just those proportions ıich bring into relief the vast extent of utility which the dustry offers to the world and his wife. The General ıd Executive Committees are mightily pleased with the ·couraging reception the results of their efforts have ought to them during these early days. But that, we ope, is only the beginning of a veritable wave. The Com-ittee were well advised to annex the extra space which as available this year adjoining last year's habitation. 'e see several advantages in this, especially on the days hen the crowd is largest. The additional space gives more rculating room, and so better opportunities for inspec-on. It has enabled the Committee to breathe more freely, take a larger view of things, and to make the Exhibit ore comprehensive than last year. Its features were de-·ribed in our special Wembley number, and the various ·ticles showed the breadth of the demonstrated interest -interest which embraces our most important Dominions, ıd our domestic and industrial life at home.

The object of the Exhibit is to serve the interests of ıe gas industry, irrespective of supply undertaking or ·anufacturing concern. The modern way of doing these ıings is by following the "all-in" policy—that is to say, resent our capabilities to the largest possible extent in manner which will be of benefit to the whole gas industry, ıd that way is the right one. In propaganda work of this ind the first thing to be done is to impress upon the ublic the facts as to what gas can do; and this is not be accomplished by a mass collection of different makers' ppliances. The respective advantages of different types ın best be told, illustrated, or proved through other chan-'els. The conversion of the public is the first matter to be taken in hand. It is fundamental to all else; and as that conversion proceeds, we can go ahead. That aspect is again exemplified in the Exhibit this year. So is another. In respect of domestic applications, our womenfolk, who dominate the arrangements in our homes, regard our offers and demonstrations from two aspects—the artistic and the utilitarian. Only last Friday at Wembley we heard one lady say that the exhibit must, and does, dispel all doubts which exist in the minds of some ladies that gas applications cannot be clothed in the artistic merit which will conform with the requirements of the modern home. Those gas engineers and managers whose minds have not developed beyond the "C" incandescent burner of the 'eighties, and the large ugly "Universal" inverted burner of the early part of this century, had better note that the modern home requires gas fittings and heating and cooking appliances of compatible design—design divested of the repulsive ugliness of past times. What is available in this respect should be patronized by all gas men, who should be the first to use every effort and every opportunity to blot out the past, and to secure greater stability by being very much up-to-date. Picturesqueness is a feature of the Gas Exhibit—refinement and beauty on lines which comply with modern taste and requirement, and arrest the attention; and they serve to bring out the vast range of utility which gas applications offer in the home—not only in this country, but in the Dominions. In the demonstration at the Exhibit, one is also struck by the considerable influence which British practice in gas application has had upon the better-class homes in the Dominions. From it all projects the vast range of utility in gas application, in both the domestic and industrial regions.

It is indeed a fine display, and much more spacious in every respect than last year. We talk, for example, in general terms of smoke abatement, of the health-giving power of the sun's rays, and of the beneficial effects of the latter being so largely diminished by the smoke-screen provided by domestic hearth and industrial chimney. The Exhibit shows how the gifts of science and increased knowledge can be utilized for the preservation of the gifts of Nature. The utilization is a responsibility, with profit attached. That has to be impressed on the communities served by the gas undertakings of the country, as well as the fact that, by utilizing fuel in a scientific manner, those who do so are serving themselves by reducing the use of those things that create labour and so deprive them of leisure, which it is easy enough to secure when unnecessary work is the cause of its attenuation or absence. Gas engineers and gas salesmen will be personally inspecting the Exhibit, and learning of the work that is going on in the demonstration and cooking hall. There are for them object-lessons in the art of propaganda. But it is the public whose attendance is desired in constant stream. The provision is there for their education; their attendance alone will make for ultimate success. Because of this, every gas undertaking should supplement the general advertising, and make known throughout their supply areas that the Exhibit is a feature of Wembley that should not be missed. Co-operative effort in securing visitors is the way to maximum success.

While writing on the Exhibit, may we particularly invite the attention of kindly disposed readers who visit the Ex-

hibit to the display of the beautiful pottery made by disabled soldiers at the Ashtead Pottery? The work is illustrated by a gas-fired oven. Sir Lawrence Weaver, who is interested in this effort to enable these men to earn their own livelihood, asks for inspection and patronage. It is a good cause, which all may confidently support and commend.

The Coke Competition.

We wish strongly to impress upon those who are working at papers for one or more of the three sections in the Coke Competition that delivery must be made, by post, to the Editor of the "Journal" not later than the 30th of June. But in order to assist those to whom the task of adjudication has been confided, it would be a convenience, and contribute to an early decision, if papers to which the finishing touches have been given are sent in before that date. We would reiterate the point that, while prizes to the amount of £1000 are offered (through the generosity of the Woodall-Duckham Companies, though they are taking no part whatever in the examination of the papers or in making the awards), the honour of being among the winners will in itself be a prize of no mean value.

Never was there a time when a competition of the kind—a pooling of information, results of experimental work or practical experience, and suggestion—was more necessary in the interests of the first and the largest revenue-producing secondary product of the industry. The condition of the coke market to-day is sufficient evidence as to the truth of this. We have to ascertain what is best to be done to improve demand, so as to restore, maintain, and even enhance the position that coke has occupied in respect of the contribution it makes to the reduction of the net cost of our primary commodity. Many minds have been occupied as to the best methods for selling coke. The question is one of larger dimensions than that. We have to get back to the very genesis of the coke, and to a proper understanding of the requirements of users, or would-be users if convinced on the point of utility and satisfied that they could constantly get what they want. The deeper we go into the matter, the more we learn of the widely diverse characteristics of coke in different places—the divergencies being such that the poor qualities in some districts do infinite harm by creating a false reputation for coke generally—the contradictory experience creating the view of unreliability. That is a pity; and the view can only be corrected of it by those whose coke cannot boast of good properties ascertaining whether, on balance, it would not pay them better to investigate the means of improving the quality. There are large fields for coke for steam-raising and other industrial use, and for domestic purposes; but the fields have to be cultivated. The demonstration of good results will alone accomplish this; and the most efficient results are only achievable by the quality of the coke being right and the conditions of its use correct. Quality of coke is a matter in which a good many well-known factors participate; and one has to consider how far those factors can be economically applied in practice. The handling of coke and its grading according to purpose are also important, and should be stressed here (though in a separate section in the competition) in company with the qualitative aspect. There are many gas-works producing and preparing coke for the market which give excellent results; and there are works which go on week after week and year after year turning-out inferior material, and attempting to dispose of it without any effort at preparing it to suitable size for the purposes to which it has to be applied. We should not in these various connections overlook the fact that the gas industry is in a position to take a large part in the solution of the problem of coal conservation through putting it (as it does) to the most profitable use from the national point of view, and by assisting in bringing about a better co-ordination of the utilization of fuel. But our credentials in respect of quality, suitability, and dependability of coke must be right if we are to realize and maintain our proper status in this matter of great national moment.

Deliberately, and from long observation, we say that this question of coke as a commodity and a contributor of no mean importance to the revenue of our industry has been permitted to drift all too long. It must not be allowed to become (perhaps to-day we ought to say continue to be) a drug in the markets. We should, if wisdom prevails, seriously concentrate on what is best to be done to make it more popular, and not sit still simply waiting for something to turn up. We know of the active influences that are at work in opposition to the utilization of tar for road purposes, and of the influential competition that there is in this respect. We know, too, that sulphate of ammonia is exposed to severe competition from increasingly powerful new sources. Thus there are many reasons why no effort should be spared to produce (within economic limits) coke which shall become so popular that the normal condition will be clear coke yards, despite greater quantities of coal being carbonized to meet the expanding utilization of gas. To this end, we sincerely hope the Coke Competition will contribute. As particulars of this are still being sought, it may be again mentioned that full information as to the sections, conditions to be observed, and the prizes to be won was given in the "Journal" for Feb. 18.

Municipal Authorities and Section 1.

The annual report of the Scottish District of the National Gas Council, which was published in the "Journal" last week (pp. 464-5), contained a reference to the position of the municipal authorities of Scotland in relation to section 1 of the Gas Regulation Act. It is a subject which has been made interesting owing to the idea which some administrators of municipal gas undertakings entertain that the therm basis would have effects of a somewhat different order (though gas consumers in one place are much the same in type and habits, and in their gas applications as those in another place) in municipal areas than in company areas. They do not appear to have heard that, in municipal gas supply areas where the system has been applied, the troubles which they apprehend have failed to materialize. A good proportion of the municipal authorities owning gas-works in Scotland—including Edinburgh and Glasgow—do not agree with their doubting English compeers; and we know that the municipal administrators of Scotland, with their native caution, do not accept innovation until they have examined it all round, and have turned it inside out. The Scottish District of the National Gas Council two years ago strongly advised municipal authorities to take early steps to apply the Gas Regulation Act. One result is that to-day 33 of the gas-possessing municipalities in Scotland are satisfactorily working on the therm system—the public have favourably received it; and there is not the slightest desire to revert to the old order of things. If Scotland, why not England? If some English municipalities, why not the remainder? We see nothing to differentiate between them; neither do the Board of Trade, as was plainly revealed when the deputation from English municipalities had early in the year, their interview on the subject with Mr P. W. L. Ashley, C.B., the Principal Assistant Secretary of the Industries and Manufactures Department, and Mr H. C. Honey, the Director of Gas Administration. It was perfectly obvious to the deputation that the Board have resolved to carry out the intentions of the Legislature in passing the Gas Regulation Act, though they would rather voluntary application be made than have to use the compulsory power conferred upon them by the Act.

In Scotland, however, there are some extremely small gas undertakings carried on by local authorities; and those who are prominent in the affairs of the Scottish District of the National Gas Council, and who have themselves voluntarily come under the Act, see good reason why such concerns without any real staff, carbonizing a small tonnage of coal a year, with few customers and low total consumptions, should be exempt from change. Some of them are not in a position to carry out tests of any description; and to leave them as they are (unless their supplies could with economy, and therefore public advantage, be taken over by a larger neighbouring concern) would not make the slightest difference to what might be regarded as the universal application of the therm system to statutory undertakings—when that desirable condition is consummated. A small deputation from Scotland—Mr James Campbell, of Dunfermline, the President of the

orth British Association of Gas Managers, and Mr. W. Napier, of Alloa, accompanied by Mr. E. J. Fottrell, the National Gas Council—have interviewed Mr. Ashley d Mr. Honey on the subject; and these gentlemen ap- ar to have been impressed by the evidence laid before em by these advocates for the exemption of the small ncerns. Neither Mr. Campbell nor Mr. Napier can be cused of desiring personal relief, for they are both work- g on the therm system (respectively with declared values 430 and 440 B.Th.U.), and are strong believers in its ing applied wherever practicable. No definite promise as made as to the exemption of small undertakings; but e matter is to receive consideration. From what is said the report, it may be that Mr. Ashley and Mr. Honey ay determine to recommend that works with an output of million cubic feet and below should not be compelled to me under the Act. In other words, that it should be thin the discretion of those responsible for such works nether or not they do so. No possible harm would be ne by that. But the final decision of the Board has to announced.

Miners Show the Way.

HE labour world appears to be in topsy-turvy state just ow; and it is difficult to presage what will happen. it from the jumble of current conditions, it is possible r the searcher after light on the position to find indica- ons which show a satisfactory movement. It is found at those labour leaders possessing magnitude of mind alize that the depression in our industries is largely due economic conditions being against them, compared ith other countries, and that the latter are getting work hich we want, but which we are unsuccessful in obtain- g owing to our circumstances, which include the con- quent burden of a mass of unemployment. A few onths ago there were many imposing claims made for gher wages by important trade unions in the country; id men, intemperate in language and prognostication, enaced the country with a year of unprecedented labour heaval and trouble in the attempt to extract extra gold om places where it does not exist, and where it is im- ssible to make more while an economic return in work not given for the money expended in wages. Unem- oyment on the grand scale continues; and these men o not show, or care, how there can be any permanent medy of the condition. The only way to remedy it is, course, to create work—not artificially, or for tem- orary purpose, for that would only mean, without other dical alterations, a return, when that work ended, to the *atus quo ante*. The creation of work must be by bringing urselves into a position competitive with other countries, id that can only be done by the co-operation of all con- rned.

As we have said, the gravity of the position is being alized by the more thoughtful and balanced minds in the bour world; and one result of this is that there have en joint conferences in different industries on the situa- on, and investigation of conditions. Probably owing to is, less is heard to-day of upheavals and doing those ings which would only bring about a more gloomy world r British labour. It is no use fighting for anything hen the issue will be to worsen the pre-existing state; id that is what is being recognized by intellects that ave not taken flight beyond the bounds of sanity. he lessened trade that is being done, and the reduction the activities of our ordinary manufacturing industries, ave made three points clear—that the amount of employ- ent must be consonant with requirement; that in order to store employment, in the affected industries, output ust cost less; and that if wages are not to be lowered, en there must be more output for the money paid. That ay, and that alone, is the route to increasing the capacity industry to pay more money, consistent with a balance tween work and pay being maintained which will enable dustry to meet competition.

The miners, engineering trades, the railwaymen, gas orkers, and others have been seeking higher pay. So ar as the gas workers are concerned, the conditions of ie industry in respect of revenue from secondary pro- icts have seriously altered; and so they have in the rail- ay world in respect of reduced traffic, owing to the state of the coal and manufacturing industries. The engineering trades are in a sad plight due to the inability to retain and obtain work in this country through the much cheaper rate at which it can be done abroad. It is a singular thing that the mining industry, poor in its circumstances to-day in consequence of the trend of adverse events (to which there has been material contribution through the autocratic and disastrous policy of the Miners' Federation), is the one which to-day is giving evidence of the effect which good work for fair pay can have upon the fortunes of previously non-paying pits. The evidence is not to the liking of the Miners' Federation and of the constituent unions; and it shows that among the rank-and-file there are intelligences at work which are leading the men to exercise their own will rather than be under the bondage of union rule, and sacrifice themselves, their dependents, and their homes. We hope this sort of thing will grow, and ultimately result in the unions conforming their policy to the conditions of the times, instead of pursuing a course which is detrimental to the interests of the members of their organizations. There has been reference in our columns on former occasions to what is being done at the Vauxhall Colliery, near Wrexham. The pit was losing money week by week, and the owners had determined to close down (as several other collieries have had to do) owing to reduced trade and inability to compete at profitable prices. Someone wisely suggested an experiment in co-operation. The threatened closing-down of the colliery had cast gloom over the neighbouring village. The men determined to give co-operation a trial, despite the appeals of an alarmed Union to have nothing to do with such an obviously prudent course; and then came the menace of suspension from the Union, upon which, however, there has not been action. A guarantee fund was started to protect the men from loss; and the whole village is happy to-day. The experiment has been going on for some weeks. About 75 p.ct. of the men are, by their own efforts, earning more than the minimum wage laid down by the national agreement; and this is solely due to a decision to give a new interpretation to the seven-hour enactment. Hitherto the accepted interpretation has been seven hours from bank to bank; but this was modified in the Vauxhall Colliery so as to substitute for the bottom of the shaft district timing stations situated about 300 yards from the seams—thus the wages paid for unproductive walking time has been transferred to the account of productive labour. The result of the longer time at the face is an increase of output from 16 to 20 p.ct.; and the hewers are earning about 10s. per ton of extra coal won. The other costs are unaltered; and the difference in the cost of production is such that the sale of the coal shows a margin of profit, instead of a loss. While this continues, there will be no fear of the men being thrown out of employment. So long as there was no chance of the colliery being run without loss, their outlook gave no hope of employment, with so many unemployed in the industry.

Those miners are pioneers in proving that past policy has been wrong—that miners have it within their power to improve the economic conditions within the industry which gives them employment, just as they have it within their power to do those things which make it impossible for large parts of the industry to be carried on. The old policy has promoted insecurity; the Vauxhall policy security and happiness. The example is having good effect. The Bedwas Collieries were about to close down; and the 2500 men affected made the proposal that they should retain their employment by increasing the output! The miners at the Houghton Colliery (Durham) have made it possible to keep it open by agreeing to work an hour longer each day. At the Birchenwood Colliery, North Staffordshire, the firemen accepted the owners' proposal that there should be co-operative working; but at a mass meeting, the miners, ill-advised by their leaders, rejected the proposal. The incident shows that co-operation is the last thing desired by the men's leaders. The Newbiggin Colliery in Northumberland had reached a stage at which the owners could not continue its operation, but the miners, rather than lose their work, have accepted a reduction in pay of 3d. per ton. The Unions do not like the accruing testimony to the pernicious effects of their unsound policy. Union leaders who adhere to and defend a policy which

inflicts injury upon an industry, and converts profitable into unprofitable production, are traitors to the interests of the members they are elected to serve. The present conditions show there are other ways than increasing wages and shortening hours by which the interests of members can be protected. The Vauxhall men have shown one way—through the simple expedient of putting in approximately seven hours at the face, and so enlarging the production per shift—and it has automatically brought them additional pay. These events are the handwriting on the wall; in them there is warning for all trade union leaders. They would do well to give heed to them, before the rank-and-file take matters into their own hands, and pursue the course which their own intelligence and conscience assure them is the right one. Greater sense has been shown at the Vauxhall and other collieries than has emanated for a long time past from the Miners' Federation. Compare it with the silly ravings and threats of Mr. Cook! The Vauxhall men have retained their employment and increased their income by rational and peaceful methods; Mr. Cook would ruin employment and pay in the industry by militant tactics.

The Government and Electricity Development.

It seems that we are getting close now to the revelation of the contents of the report of Lord Weir's Committee, who have been considering the question of electrical development on the national scale. The Prime Minister, speaking last Friday at the Oxford University Conservative Association, stated that the report has been completed; its recommendations are being most carefully examined by the Cabinet; and if, in the result, they endorse the Committee's policy, its carrying out will be the first important task the House of Commons will have to face on reassembling in the autumn. From another source, it is learned that the recommendations have already been under the consideration of the Minister of Transport (Lieut.-Col. Wilfrid Ashley); and a Memorandum has been circulated among the members of the Cabinet. With what degree of actual knowledge the same Parliamentary authority gives the information, we do not know, but he asserts that Ministers regard the proposals which have emanated from the Committee as providing the basis for an excellent scheme, and that the main object of the Bill which is being framed is to make provision for linking-up generating stations, and co-ordinating and standardizing their power service.

Reverting to the speech of the Prime Minister. He appears to be obsessed by the idea of "cheap power." There are other things which are more important to industry, and which would help it far more if they were "cheapened," or lowered in their pecuniary weight. It is quite true that we consume less units of electrical energy than other countries, which, the Prime Minister asserts, are inferior to our own in industrial production. The latter is not a recommendation to an acceptance of their example in the consumption of more units of electrical power. Notwithstanding, the Prime Minister considers that, unless something is done, and done quickly, the discrepancy between this country and others in respect of electrical power consumption will increase by leaps and bounds, year by year, until we are unable to compete. The Prime Minister should come down to earth from the heights to which he is soaring in this matter, and inquire what are the actual power costs per unit of production in this country compared with others dependent (as we are) upon solid fuel for the generation of electricity. He should also make research into the question of the proportion that power costs have in the total costs of manufacture per unit of output. We think he would be astonished at the smallness. The exercise might cause him to conclude that it is not the expense of power but other items in the total costs of production which really matter, and which are the brakes upon the industrial progress of this country. Incidentally, he might further find that heat is no less important to industry than power. We shall be interested in learning precisely the lines of the report and recommendations of Lord Weir's Committee. Some indication may be given tomorrow, as, on the estimates of the Ministry of Transport being introduced for discussion, the Liberal Party are proposing to raise the question of the development of electricity supply; and the Government may use the opportunity for an announcement as to their proposals.

The King and Queen.

The King and Queen were highly interested during the tour of the Gas Exhibit last week. His Majesty recalled t fact that last year one of the attractions was the "Seven Ag of Woman," and that there were children in the nursery scen Their Majesties were also interested in the tar exhibit (not f away) of the National Gas Council. No one should miss th People are talking of the delightful conception of the scene the sign of "The Jolly Jack Tar." Members of highw authorities and road surveyors are being invited to visit t exhibit, and to obtain information from the expert in charg A little local influence might be added to the official invitation

Good Attendance Record.

The total number of visitors to the British Empire E hibition this year up to, and including, last Saturday w 348,192. The total number of visitors in the week, excludir the opening day, was 227,475. Last year's figures for the fi six days, which included the Cup Final day, totalled on 301,555. It is therefore evident that the attendance this ye has, so far, greatly increased over last year, during the simil period. The total number of visitors on Saturday was 99,252

A Colliery for Sale.

It is not often that in our editorial columns we special draw attention to advertisements. The idea of gas unde takings becoming colliery owners is not a new one. It h frequently been discussed by municipal authorities owning ga works; but the suggestion has never matured. Among o "For Sale" advertisements to-day is one offering the Re heugh Colliery for sale. This is situated at Gateshead-on-Tyn It is estimated that unworked coal is available there for fif to sixty years; and the present owners consider that it wou be a paying proposition for acquisition by gas-works, coke a bye-product manufacturers, engineers, &c. Those who ha thought it would be a good thing for their gas-works to own colliery will perhaps be inclined to probe further this defini suggestion, and ascertain whether there is real economy in for gas-making purposes. There has been no time within th past decade when, we imagine, collieries could be purchased a lower figure than to-day.

Coal Industry Inquiry.

If no definite result issues from the joint inquiry into th economic position of the coal industry by the Mining Associ tion and the Miners' Federation, the facts revealed by th investigation must have some good influence in reducing th chasm between the owners and the miners. A statemer which has been issued as to the proceedings shows that th course of procedure resolved upon was that the facts relatin to the present position of the industry should first be examine that the question of causes should next be considered, and th remedies should then be discussed. Among the first facts di cussed was the reduction of the export trade—from 74 millio tons in 1913 to 62 millions in 1924, and at the rate of 52 mi lions per annum in the first three months of this year. Th average f.o.b. price at the port of shipment was 23s. 4d.; an this has been reduced to 20s. 9d., which figure in preser circumstances means a loss of about 1s. 6d. on every ton e ported. The wages cost in Germany is about 50 p.ct. of t total costs, as against 70 p.ct. in this country. While earning and labour costs are less in Germany than here, the othe items of expenditure are higher. The miners' representative point out that the cost of living in Germany is not so great a in this country. Reference is also made to the great increas in the production of brown coal in Germany—124 million ton in 1924, compared with 87 million tons in 1913—which enter into competition with German black coal, and thus intensifie the competition with British coal. Bearing also upon compet tion is the fact of the increased output capacity. For instance the sales policy of the Westphalian Syndicate is now base on an output capacity nearly 70 p.ct. in excess of that of 1913.

British Costs and Effects.

A comparison is given of working costs in 1913-14 com pared with May to December, 1924. In the former period, th total costs per ton of commercially disposable coal wer 9s. 5½d., of which wages accounted for 6s. 10½d. In the latte period the costs were 18s. 11·74d., of which wages accounte

13s. 6·7d. The earnings per shift were 6s. 5·64d. in 1913-14, compared with 10s. 10·32d. in May-December, 1924. The put of coal per shift in the respective periods was 20·23 cwt. 17·8 cwt. Thus while the earnings have gone up 67·9 p.ct., output has been reduced by 12·1 p.ct. Figures were pre-ted which show that in the period from May to December year, 111 pits were closed, involving 59,000 men. On y 7, the Secretary of Mines stated that 256 coal mines, mally employing 55,300 wage earners, have been closed ce Nov. 1, 1924, and have not been re-opened. During the ne period, 90 mines, employing 10,000 wage earners, have n opened or re-opened. The total number of persons unem-yed in the industry in March was 148,358, or 11·8 p.ct. of total employed. Transport and freight charges have also n considered. Other points have yet to be cleared up, and n the question of causes and possible remedies will be icked. Meantime, an illustration of one good remedy (re-red to in an editorial article in this issue) is being supplied co-operative working, in which the men are doing a better t. The average increase in earnings and the reduced output shift mentioned above, which combine adversely to affect costs per ton, are highly important factors.

ıde Facilities Act.

Further guarantees under the Trade Facilities Act have n given by the Treasury, bringing the aggregate at March to £55,577,811. Among the new items is £26,000 to the ot District Gas and Electricity Company, Ltd., and ,000,000 to Synthetic Ammonia and Nitrates, Ltd. The ıarantee to the latter is to cover the extension of the plant.

ting of Machinery.

The Central Executive Board of the National Gas Council e had under consideration the Rating and Valuation Bill; l a Special Rating Committee of the Council are closely tching it. The fact that the rating of machinery has been rievance among manufacturers for a long period was alluded in a speech by Mr. Neville Chamberlain in the House of mmons last Wednesday. He reminded members that a De-tmental Committee, which studied the question in 1923, nd that in the application of the law there was a serious k of uniformity between unions, which ought, if possible, to remedied. Concluding that manufacturers were entitled to ne relief, they recommended that loose tools and plant and chines operated by hand or foot should be excluded from ing, and that the rest of the machinery should be divided o two classes. One class was to be considered as part of the reditament and be fully rated. This was to include motive ver, lighting, heating, and ventilating apparatus, lifts, eleva-s, rails, and tramway tracks and plant or combinations of nt and machinery of the nature of the structure. The ond class was process machinery, which was also to be ed, but was to receive a rebate of 25 p.ct. of the amount of rate. The Committee also made proposals as to the setting of a panel of referees who might decide whether any par-ılar piece of machinery fell into one or other of the two sses. The Bill follows the recommendations of the Com-ttee. Mr. Chamberlain does not think it possible, however, put into the Bill a complete schedule of machinery to be ly rated; and he has adopted the expedient of setting up a mmittee whose duty will be to compile a list. This will be ised at intervals; and there is provision in the Bill for ections to be made and heard. The Committee rejected oposals of this kind on the ground that they were impractic-e; but Mr. Chamberlain does not see why this should be

He is also unable to accept the Committee's suggestion ıt certain machinery should be subject to 25 p.ct. rebate. e expense and protracted delay that would be involved in uing all this machinery, from which only 75 p.ct. would be ained for the rates, does not seem to him to be a business position. He feels that putting a charge upon a manu-turer because he is bringing his machinery up to date and tting himself in a position to compete more effectively with foreign competitors, is a thing which ought not to be couraged. The relief which the exemption of machinery l bring to the manufacturers will help them to increase ir output, and to employ more men; and therefore it will rease the general charge upon the ratepayers.

PERSONAL.

The Stockton Corporation have congratulated their Gas Engineer, Mr. W. W. Atley, on his appointment as President of the North of England Gas Managers' Association, and have given permission for the Association to be invited to hold their October meeting in Stockton.

Mr. T. J. Ashley, who for about twenty years has occupied the position of Chief Engineer to Messrs. Aldridge & Ranken, and as such has been known to a large number of gas engineers both in this country and abroad, has retired owing to ill-health, and will reside at Broadstairs. Mr. R. W. Green, on behalf of the Directors and staff, presented Mr. Ashley with a club arm-chair, in recognition of his unvarying kindness to the staff. Mr. Ashley, who has been a Director of the Company since its formation, will retain his seat on the Board; and Mr. Green, who has been with the Company for over seventeen years, has been appointed Chief Engineer.

Mr. J. W. Walker has been appointed Chief Salesman to Messrs. J. & G. Wells, Ltd., and his address is now Eckington Collieries, near Sheffield. His son, Mr. J. W. Walker, Jun., will succeed him as the Company's Agent for London, the Southern and Eastern Counties, Birmingham, and Midland Districts; and his address is "Ashleigh," No. 255, Grove Lane, Handsworth, Birmingham.

OBITUARY.

E. J. BROCKWAY.

We regret to announce the death of Mr. E. J. Brockway, J.P., Engineer, Manager, and Secretary of the Cleethorpes Gas Company, who, on May 11, passed away at his residence, Sussex House, Cleethorpes, in his 65th year.

Mr. Brockway, who was a native of Salisbury, began his connection with the gas industry at the works of Messrs. Willey & Co., Exeter. After completing his apprenticeship, he became an assistant to a gas engineer who owned or leased several gas-works. Here Mr. Brockway gained a good deal of experience in management and constructional work on a small scale. After four years as Assistant Engineer at Malton, he went to the Oakham Gas-Works as Engineer and Manager, and in 1890 left Oakham to go to Cleethorpes.

Some idea of the outstanding progress of the town and district of Cleethorpes, and incidentally of the Company who have served it so well in the matter of gas supply, is furnished by the fact that when Mr. Brockway first took up his duties in 1890 at Cleethorpes, the annual output of gas was about 20 million c.ft., while to-day it is just over 300 million c.ft. This has necessitated the laying of a considerable mileage of mains and services per annum, as well as rapid and extensive works reconstructions and additions. With increases over the previous year's output amounting at times to as much as 50 p.ct., it required considerable skill and foresight, not to mention courage, in order to avoid committing the Company to expedients which in the long run often prove disproportionately costly. That the late Manager achieved remarkable and lasting success in meeting these extraordinary conditions is evidenced by the present exceedingly prosperous state of the Company, and by the fact that they have consistently paid maximum dividends for the past 27 years.

In 1896 Mr. Brockway was elected President of the Eastern Counties Gas Managers' Association, and later served as District Member of Council of the Institution of Gas Engineers. As is well known, he was one of the pioneers in carbonization by means of vertical retorts. His experiments on a practical scale began with the Settle-Padfield process, from which he, in conjunction with Messrs. Robert Dempster & Sons, Ltd., of Elland, evolved a very successful form of intermittent retort which is still in operation at the Cleethorpes Works. Later he adopted the Dempster-Toogood continuous system, which is now working in conjunction with the intermittents—the combination making a very flexible and efficient production unit. Various other interesting experiments in plant and methods which have been initiated by Mr. Brockway and tried at Cleethorpes have been recorded from time to time in these columns, and the industry is the loser by the passing of such a devoted servant and able propagandist.

Mr. Brockway was, at the time of his death, a Director of the Woodhall Spa Gas and Water Company, which is also a very flourishing concern. He was formerly the sole proprietor of the Kirton Gas-Works, near Boston, Lincs., and Consulting Engineer to the Skegness Gas Company and the Bolsover Gas Company. As a County Magistrate and former Chairman of the Cleethorpes Urban District Council, he was highly regarded for the worth of his public services. Up to the time of his death he was Chairman of the Official Advertising Committee of the town, and did much to enhance the reputation of Cleethorpes as a health and pleasure resort. In the masonic world he secured high honours, and was one of the founders and past masters of the Lord Worsley Lodge, Cleethorpes. He was also a keen motorist and a founder of the Lincolnshire Automobile Club.

ELECTRICITY SUPPLY MEMORANDA

A correspondent in the provinces calls attention to some comments by "Meteor" in the "Electrical Times" for May 7, under the heading of "Burn More Gas and Coke;" and, in his letter, referring to the nature and form of those comments, he makes a remark which we will not repeat lest it hurts the feelings of our contemporary. Perhaps our correspondent does not know of the capacity of "Meteor" for utilizing in his writings the foam of sarcasm and generalities, instead of dealing with solid and material facts. The subjects of his sarcasm and platitudes on this occasion are statements made at the Chester District Conference of the British Commercial Gas Association regarding the relative economic merits of gas and electricity for various domestic and industrial purposes. Not in any part of his thin criticism does he advance a single point which negatives, by definite data, the statements made at that conference. If he will put forward such data, there will be both pleasure and profit in dealing with them. We will only touch on one point. He remarks: "Where gas meets electricity in a fair field, on anything like equal terms, electricity wins every time, and these frantic gas advocates know it." Does he mean "for heating, cooking, lighting, power, and every other conceivable purpose"? If so, then let us have, instead of the nonsense in the paragraphs before us, the evidence based on the "equal terms" for each of those purposes. Meantime, in his spare moments, "Meteor" might consider why it is that there are millions of gas cookers and gas fires in use in this country. Why is it that they have been increasing during immediate past years at a rate per annum without precedent? Why is it that, if electricity wins every time, the new heating connections made by gas in any locality far exceed those made by electricity? Why is it that one London Gas Company alone supplies more heat energy than the whole of the electricity supply undertakings in the country? "Meteor" should endeavour not to expose himself to ridicule when he opens the floodgates of his exiguous satire.

Sarcasm to Avoid Facts.

"Economy" of Electric Cooking.

The electrical people are not a little perturbed regarding the fact that experience by consumers with electric cookers is not aiding them in increasing the rate of output. After the first splash, demand declines; and the gas industry involuntarily increases its store of knowledge as to the dissatisfaction of users over their experiences, particularly in the matter of costs. To complaints of exorbitant expense for service rendered, the electrical people reply that it is all nonsense, and consumers are making a great mistake. But all the finesse they can bring to bear will not convince the users of the cookers that they must not trust the evidence of their own senses and payments. It is a considerable drawback to the electric cooker, apart from the expensiveness of electrical B.Th.U., that the experienced user of a gas-cooker has become accustomed to its flexibility and the large range of application of the hotplate, which, when attempted on the electric hotplate, results in an ugly shock. The electrician endeavours to console the user by telling him or her that it is only a question of refinement—a delicate care in the employment of the cooker—and all will be well. Now it is very easy to test the thermal and money cost of performing a given operation by the rival cookers, by doing the same work under the same conditions in both. If one ascertains from the meters the input of gas and electricity (the calorific power of the former is stated on every gas account rendered on the therm basis), then one knows the amount of heat expended usefully and in waste without going into all sorts of complexity to ascertain how and where the thermal energy goes. That is simple and truthful; so simple and truthful that we have been both amused and amazed at the essay of Mr. E. G. Ross, Assoc.M.Inst.E.E., in a recent issue of the "Electrical Review," to show that the idea of uneconomy even on the electric hotplate is due to misconception, and that by calculation it can be found that there is an actual money saving compared with the gas-cooker.

The Inception of the Argument.

Mr. Ross shows wonderfully profound thought, and an excellent capacity for arithmetical gymnastics, so that a plain method of making a test and calculation is displaced by something absolutely complex. We should like his article to be submitted to a layman, and see what he can make of the assumptions, crude testings, and gradually mounting-up totals for gas and subtractions for electricity, which are intended to show that electric cooking is at least 15 p.ct. cheaper overall than gas cooking—"other conditions being equal." Let us see how our critic arrives at this. He prefaces his singularly constructed statement with the remark that the advantage of electricity over gas for cooking in point of price is due entirely to the economic conditions attendant upon its use; and it is not true to say that it is intrinsically cheaper than gas for the purpose. We suppose that the "intrinsically" intends to convey that the heat energy of the gas is cheaper than that of electricity, but in its application it beco dearer. But the argument which follows, if it is intende prove anything, is (in our opinion) directed to showing electric cooking is "intrinsically cheaper" than gas cook Mr. Ross assumes that for a given article to be coo 1000 B.Th.U. are necessary over one hour, and that the ciency of the cooker is 100 p.ct. The gas required is there 0·01 therm. As there are 3420 B.Th.U. in 1 kw.-h., equivalent electrical energy required is 0·293 kw.-h. He ta as a "reasonable" price for gas 10d. per therm, and ¾d. kw.-h. for electricity. How many places supply current heating at ¾d. per kw.-h.? However, on his own figures, respective costs are 0·1d. for gas and 0·22d. for electricity. course, there are no gas or electric boiling rings which have efficiency of 100 p.ct. Thus there succeed the twistings writhings of Mr. Ross to prove the ultimate thermal and th fore cost inferiority of gas, while it could be done by a m simple process.

Its Development.

We cannot repress a smile over the point in the much-laboured case. Ross says "the prime economical advantage of gas lies in the fact that a current of air is ab lutely essential for the maintenance of the heat—involv (*a*) a free ingress of air to the boiling-ring, and (*b*) a defi minimum distance between the cooking utensil and the burn so that no back-pressure is put upon the jet." The scie underlying that statement is as difficult to find as is the rea for its appearance in a technical paper. There can be no c bustion for the development of heat without air is availab and the fact of complete combustion being obtained sh that, by the physical and chemical processes involved, the is—by the aid of the air, and in the circumstances of its us developing its full measure of heat. As to the distance betw the cooking utensil and the burner, this is necessary in or that the flames may not be checked, and so deprived of opportunity of developing their full potentiality in supply heat to the vessel above. Then our learned friend procee "From data variously collected, it would seem that when b ing for approximately four hours in a pot about 5½ in. diame anything from a minimum of 30 p.ct. to a maximum of 60 p of the available gas heat is lost, due to these essential co tions of burning. This fact is probably the most serious w which the gas people have to contend." In passing, it may pointed out that, if a pot only 5½ in. diameter was kept boil over a ring of gas-jets for approximately four hours, we afraid that, long before that time had expired, there would nothing left in the pot to boil—unless, of course, it was me kept simmering by nothing but a trace of flame. As to the l of heat due to the reasons our friend suggests, his minimum 30 p.ct. is nearer normal practice to-day than the maxim of 60 p.ct. As a matter of fact, the modern boiling-ring on hotplate of a gas cooker is quite capable of developing 70 p efficiency. We ask our friend whether he can suggest to any electric boiling plate which will at any part of its life continuously give an efficiency of 70 p.ct.; and is it not the that most electric hotplates will only develop (when new) to 45 p.ct. efficiency, and that a diminishing quantity with u It is no use Mr. Ross indulging in generalities if he cares reply, because experimental work has satisfied us on this p ticular point. Yet he deliberately states in his article t the electrical heat loss "appears" (which is not very positi to vary from a minimum of 5 p.ct. to a maximum of 12 p. because of the fact that the pot bottom may be as little as ¼ from the heating point. If he means by this that electric b ing plates will develop 88 to 95 p.ct. efficiency, we can accept the statement. However, Mr. Ross makes out th applying the correction for this particular loss, 1450 B.Th would be required with gas for the actual heat input 1000 B.Th.U. to the article to be boiled, while the correc electric power equivalent is 1085 B.Th.U. It is seen from own admission that the efficiency figures have been procu by more or less loose methods. He says they were obtained time measurement, combined with meter readings of consur tion, and also by "approximate" calorimetric methods, a he refers to the results as "reasonably representative." It usual in work of this kind to adopt scientific processes; and, order to judge of reliability, we should like to know more to what Mr. Ross actually did in this respect. On the evide of his articles we maintain distinctly and deliberately that th are not reliable. He has to face the fact that if he is rig then prior scientific work in this connection has gone astr though carried out by men of noted scientific attainments.

Further Gas Losses!

Our critic seeks to show that we guilty of further losses to add to previous waste delinquencies, and narrow still more the difference between the consumption heat energy supplied by gas and that by electricity. He found that the ribs across the hotplate for supporting the co ing utensils are responsible for a large loss of heat by cond tion and radiation. Mr. Ross appears to be ignorant of fact that the gas industry found that out long ago; hence reason that the construction of the top of most modern ty of gas cooker is such that no bars intersect the flames. T point might have applied a few years ago, but there is no n

ay to introduce the criticism, as it does not apply to the lern cooker. As a matter of fact, we have the authority of Hartley (who has made more cooker tests probably than other chemist or physicist) that the best gas cookers of the ent day show a saving of from 25 to 33 p.ct., compared n those of the pre-war period. Mr. Ross admits the difficulty iving definite data for heat losses; and then we have another mple of how crudely the data he uses have been arrived at. safeguards himself at this particular point by the use of word "if." "If thermometer readings are any rough cation, then for cookers of the same output, which very erally have the same top perimeter and weight of metal, it be found that, after the four hours' boiling referred to ve, and for the same cooking, of course, the following ap-ximate figures hold—viz., temperature round perimeter of plate for gas cooker 150° to 200° Fahr.; for electric cooker, to 100° Fahr. The average values are 175° and 75° Fahr. pectively." Then we are treated to a little reference to the ific heat of iron; followed by the statement that the heat essary to raise this mass to from 50° to 75° Fahr. works at about 51 B.Th.U. Similarly to raise it from 50° to 175° ir., about 255 B.Th.U. are required. These values, he es, will further alter the heat inputs in the example; and ie now become: Gas input, 1705 B.Th.U. Electricity input, 5 B.Th.U. per hour. To make it still more intricate, he is that the quantity of foodstuffs required to be cooked is n the electric cooker from 18 to 25 p.ct. less than that re-ed for cooking by gas. Whence he gets these figures, aven only knows. "Foodstuffs" which are cooked on a or any other cooker have a tremendous range; and we not imagine that any foodstuffs would (cooked by heat sup-d by one agent, and with equivalent temperatures and other ditions) play such foolish tricks as to reduce themselves e with the heat supplied by one means than by another. wever, the compiler of this queer article takes credit for monstrous proceeding on the part of foodstuffs. He says is advisable to consider two identical completely cooked erials, it being recognized that the quantity of material essary originally for the electrically cooked meal must be p.ct. (average) less than that required for the gas cooked al." In other words, for a gas heat input of 1000 B.Th.U., corrected electrical heat input is only 785 B.Th.U. Correct the latter figure for the various losses previously considered, ratio becomes 1705/903.

Finally. So, by these pretty contortions, Mr. Ross eventually arrives at the conversion of the ratio into a price ratio on basis of 10d. per therm for gas, and ¾d. per unit for electricity. It becomes 0·17d./0·199d.—that is, the gas charge is by 14½ p.ct. than that for electricity. Again this remark-e investigator says that observations have shown that, with electric cooker the net effective cooking time—*i.e.*, the time ing which current was actually flowing through the elements aried from 60 to 87 p.ct. of the time during which gas was ned for the same general meals. That is diametrically osed to the findings of other observers. Taking the average 75 p.ct., he holds that economically the ratio obtained must ther be corrected to take account of the consumption of p.ct. less energy with the electric cooker, due to the fact t it is more or less impracticable to keep on extinguishing relighting the gas, while (say) "pouring" potatoes, cab-es, and the like. Hence the consumption ratio becomes 5/689; and the charge ratio 0·17d./0·151d. The electricity rge is now 11 p.ct. cheaper than the gas charge. Con-ling, Mr. Ross reiterates that, intrinsically, electric cooking lefinitely not cheaper than gas cooking; but economically it o to the tune of approximately one-eighth. He has, how-r, the good conscience to acknowledge that he has taken a y low price for the unit of electricity, and that even then difference is so narrow between the competitive rates that price of ¾d. is much too high for successful competition inst gas for cooking purposes. It only requires, as he ognizes, a little lack of operative skill to cause the power s for electric cooking to take surprising flights. But after this laboured construction, there is a simpler plan of arriving efficiency and costs than the complex one which Mr. Ross arently prefers to adopt, and which would simply confound consumer. The input of thermal energy required for per-ning a definite amount of work covers all the debits and dits which he has discovered, and the price of that input is ertainable in every case. After all this, will Mr. Ross accept hallenge to do an equal amount of work with an electric ker (oven and hotplate) as with a gas cooker, at a cost for uel" of ¾d. per unit for electricity and 10d. per therm for , or 3420 B.Th.U. as against 7500 B.Th.U. for ¾d. in each e?

Growing Gas Consumption Per Head.—In a comparison be-en certain figures for 1923 and 1924, the Pacific Gas and ctric Company, of San Francisco, report that during last r the number of consumers in their territory increased by 706; while the gas sales per consumer rose from 39,800 c.ft. 2,400 c.ft.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

May 21.—British Commercial Gas Association, Manchester District (West Riding of Yorkshire Section) Conference, in the Harlow Manor Hydro, Harrogate, under the presidency of Mr. Francis Barber, the Chairman of the Harrogate Gas Company. Luncheon with the Chairman and Directors of the Company will precede the business, which will include an address on "Light and Health," by Mr. R. Veitch Clark, M.A., M.B. (Medical Officer of Health to the City of Manchester), and a paper entitled "Gas as a Public Service," by Mr. Frank H. Robinson, Assoc.M.Inst.C.E. (Engineer and Manager to the Harrogate Gas Company).

May 22.—Quarterly meeting of the Manchester District Institution of Gas Engineers, at the Harlow Manor Hydro, Harrogate. Mr. Frank H. Robinson, of Harrogate, will preside; and a general discussion will be opened by Mr. W. B. M'Lusky, of Halifax. A luncheon will be given by the Chairman and Directors of the Harrogate Gas Company, following which the members will inspect the gas-works.

May 23.—Half-yearly Auxiliary Meeting of the North of England Gas Managers' Association, at the Armstrong College, Newcastle-on-Tyne, at two o'clock. The chair will be taken by Dr. Geoffrey Weyman, of Newcastle. There will be an inspection of the Chemical, Physical, Engineering, and Metallurgical Laboratories of the College.

May 23.—Meeting of the Wales and Monmouthshire Junior Gas Association, at Treforest. Dr. Illingworth will give an address on "Low-Temperature Carbonization." Subsequently the members will adjourn to the Council Buildings, Pontypridd, to hear an address by Mr. D. Muir, on "Methods Adopted to Deal with Leakage in Colliery Districts."

May 26.—Seventh annual general meeting of the National Gas Council, at the Hotel Great Central, Marylebone Road, N.W., at 11.30. The President (Mr. D. Milne Watson) will present the annual report and statement of accounts.

May 28.—Meeting of the Wales and Monmouthshire District Institution of Gas Engineers and Managers, at Porthcawl. Mr. H. D. Madden, of Cardiff, will read a paper on "General Sales Propaganda."

May 29.—Sixth annual general meeting of the Chemical Engineering Group of the Society of Chemical Industry, at the Chemical Industry Club at 8.15. Mr. C. S. Garland, B.Sc., A.R.C.Sc., F.I.C., Chairman of the Group, will preside. The meeting will be preceded by an informal dinner in the Club at seven o'clock.

June 4.—Joint meeting of the Districts of the Southern Association of Gas Engineers and Managers, at Bournemouth.

June 5.—Visit of the Southern Association of Gas Engineers and Managers to the works of the Bournemouth Gas and Water Company.

June 6.—Annual outing, at Anstruther, of the Scottish Junior Gas Association (Eastern District).

June 9-11.—Annual general meeting of the Institution of Gas Engineers, in the Great Hall of the Institution of Civil Engineers, Great George Street, Westminster.

June 10.—Annual general meeting of the Association of Statutory Inspectors of Gas Meters, at the new County Hall, Westminster. The afternoon will be devoted to a visit to the Finsbury gas meter testing office.

June 11.—Visit of the Coke Oven Managers' Association (Midland Section) to the Barugh plant of Low-Temperature Carbonisation, Ltd.

June 12.—Visit of the Institution of Gas Engineers to Derby.

June 20.—Visit of the London and Southern District Junior Gas Association to the Cambridge Gas-Works.

July 9.—Visit of the Coke Oven Managers' Association (Midland Section) to the works of Messrs. Stainby and Lyon, of Knottingley.

Institution of Civil Engineers' Council.—The ballot for the election of the Council, at the annual general meeting of the Institution of Civil Engineers, resulted in the following elections: President, Sir William Henry Ellis, G.B.E., D.Eng. (Sheffield); Vice-Presidents, Mr. Frederick Palmer, C.I.E.; Sir Archibald Denny, Bart.; Mr. Ernest F. C. Trench, C.B.E., M.A., B.A.I.; and Captain Matthew H. P. Riall Sankey, C.B., C.B.E., R.E. (ret.). Other members of the Council include Sir Dugald Clerk, K.B.E., D.Sc., F.R.S.; Prof. W. E. Dalby, M.A., F.R.S.; Sir Robert A. Hadfield, Bart., D.Sc., D.Met., F.R.S.; Sir Henry P. Maybury, K.C.M.G., C.B.; and Sir Richard A. S. Redmayne, K.C.B., M.Sc. This Council will take office on the first Tuesday in November next.

INSTITUTION OF GAS ENGINEERS.

Balloting List.

The following candidates have been approved for the next balloting list of the Institution of Gas Engineers:

For the Class of Member.

Ashworth, Richard, Engineer, Manager, and Secretary, Tamworth Gas Company.

Calderwood, Robert John, Gas and Water Engineer and Manager, Spalding Urban District Council.

Greenough, Peter, Gas and Water Engineer, Hindley Urban District Council Gas Department.

Robertshaw, Walter Livsey, Works Manager of the Ayre's Quay Works of the Sunderland Gas Company.

Surtees, Gilbert, Engineer and Manager, Uttoxeter Gas-Works, Ltd.

Watson, Alfred Thomas, Engineer and Manager, Rushden and Higham Ferrers District Gas Company.

Whatley, Greville John, Assistant to Mr. F. H. Jones, Westminster.

For the Class of Associate Member.

Carmichael, Stanley, Works Chemist, Avon Street Gas-Works, Bristol.

Dupont, Fernand, Chief Assistant Engineer at the Works of the Neath Corporation Gas Department.

Ely, Robert John, Assistant Manager of the Riddings District Gas Company.

Fall, Frederick Percy, Engineering Assistant and Chief Draughtsman to the Engineer of the Sunderland Gas Company.

Robson, Colin, Technical and Chemist Assistant, Elswick Gas-Works, Newcastle-on-Tyne.

Winch, Egbert Harold, Second Assistant with the Cambridge University and Town Gas Light Company.

Students.

The following candidates for studentship have been approved:

Calderwood, Robert Wallace, Assistant at the Gas-Works, Spalding.

Ware, Gilbert Charles James, Articled Pupil, Redhill Gas Company.

Williams, Rowland J., First Assistant Engineer and Manager, Gas-Works, Abertillery.

NATIONAL GAS COUNCIL.

Central Executive Board Meeting.

The Central Executive Board of the National Gas Council met on Tuesday, May 12, at No. 28, Grosvenor Gardens, S.W. In the absence of Mr. D. Milne Watson, the chair was taken by Mr. William Cash, F.C.A. (Vice-Chairman).

Nomination of Candidate for the Office of President.

It was reported that no nominations had been received for the office of President; and Mr. Milne Watson was unanimously nominated as candidate for the Presidency for another year.

Draft Annual Report and Statement of Accounts.

The draft annual report and statement of accounts were considered, amended, and approved for submission to the annual meeting.

Roads Improvement Bill.

It was reported that a conference of Public Utility Associations convened by the Council had met and considered this Bill, and had come to the conclusion that a protective clause in favour of statutory undertakings was required. Certain other amendments were moved, on the suggestion of the National Gas Council alone, for the purpose of ensuring:

(*a*) That the road construction experiments should be carried out only by an organization interested in the production of that material with which the road was being constructed.

(*b*) That the object of the experiments should be to discover a method of embodying British produced materials only—*e.g.*, tar, in contradistinction to bitumen.

(*c*) That there should be a representative Committee set up, similar to that appointed under the Traffic Act, to advise the Ministry as to the scope and nature of the experiments.

Certain assurances in connection with these experiments were obtained from the Minister when the Bill came before the Standing Committee.

Newport Corporation Bill.

It was reported that the Newport Corporation electricity undertaking had endeavoured to lay-down stipulations from time to time to the effect that the occupants of houses on estates belonging to the Corporation should use electricity for lighting and other purposes. At the instance of the Newport (Mon.) Gas Company, the matter had been argued at length before a Select Committee of the House, who agreed to the insertion of the following sub-clause:

(4) The Corporation shall not make or impose under the powers of this section any term, condition, or restriction with respect to the form of light, heat, power, or energy to be used in any house, shop, office, warehouse, or other building, or on any lands, or with respect to the taking from any particular local authority, company, body, or person of any form of light, heat, power, or energy.

Rating and Valuation Bill.

The provisions of the new Bill were discussed, particularly in relation to the new proposals which were made in connec with public utility undertakers. Consideration was also gi to the suggestions in the Bill with regard to the rating machinery.

After full discussion, the same was remitted to the Spe Rating Committee of the Council.

Factory and Workshop Act, 1901—Chemical Regulatio 1922.

It was reported that the "certificates of exemption" wh had, after considerable delay, been granted by the Home O to certain of the smaller gas undertakings, whose claims exemption had been submitted by the Council, were altoget inadequate, and afforded no relief whatever to the un taking.

A protest was being made both by the Council and by the undertakings concerned, with a view to obtaining further c cessions in regard to these Chemical Regulations.

Tar Exhibit at Wembley.

It was reported that a stand had now been erected Wembley in the Chemical Hall of the Exhibition, and was charge of an expert on tar for road purposes. It was also ported that the attention of road surveyors and chairmen Highways Committees throughout the country would be dra to this exhibit, and that they would be invited to visit it.

The Board authorized the Council's Tar Committee to serve space for a road tar exhibit at the Road and Transp Exhibition, to be held in November next.

Illuminating Engineering Society.

It was agreed that the Council should be represented u the Council of the Illuminating Engineering Society, and t Mr. D. Milne Watson should be asked to represent the Cou thereon.

Deputation of Scottish Municipal Representatives to Board of Trade.

A deputation to the Board of Trade was reported to h taken place on April 6, consisting of Mr. Campbell, of D fermline (President of the North British Association of Managers), and Mr. J. W. Napier (Secretary of the Scot District Executive Board of the Council), together with Mr. J. Fottrell. The deputation assured the officials of the Bo of Trade that the application of the Gas Regulation Act to S land had been very satisfactory and successful, and there no objection to it whatever, so far as the larger undertaki were concerned. It was felt, however, that, with regard the smaller municipal undertakings, there were certain seri difficulties in coming under section 1 of the Act—*inter a* the additional expense of providing the necessary testing stat and apparatus, the fee of the gas examiner, &c. In cases wh an undertaking has a small output of gas, with a limi number of consumers and a very small staff, the application Orders to such undertakings was likely to have a detrimen effect.

It was reported that this deputation had been sympathetic received; and it appeared probable that the thermal system charging would not be imposed upon the very small un takings.

Conference between Public Utility Associations at Ministry of Transport.

A conference was reported on the 7th inst., at the Minis of Transport, between representatives of gas, water, and e tricity interests on the one hand, and the County Councils' A ciation, the London County Council, representatives of Rural and Urban District Associations, and other bodies in ested in highway construction. It was reported that the ma arose out of a memorandum of the County Councils' Asso tion, in which they endeavoured, in brief, to remove all existing rights of statutory undertakers in regard to mains cables in highways, and, in fact, to make them revert to position of non-statutory undertakings.

As a result of this conference, a small Sub-Committee h been set-up, which was meeting immediately, and upon wh the gas industry was represented; and it was hoped to ag general principles, and to draw-up some agreed clauses sa factory to all parties.

It was further reported that the public utility undertak were asking for representation upon the new Committee set by the Home Secretary in connection with the law on diversion of highways.

Central Executive Board—June Meeting.

It was agreed that, inasmuch as the meeting of the Inst tion of Gas Engineers would be taking place on Tuesd June 9, the next meeting of the Central Executive Board sho take place on Monday, June 8, at 3.30 p.m.

Will.—Mr. Samuel Peter Austin, a Director of the Sunc land Gas Company, left unsettled property to the value £123,684 (net £123,338).

British Engineers' Association.—The new President of British Engineers' Association is Mr. H. J. Ward, of Mess J. & E. Hall, Ltd. (Dartford). He succeeds Sir Ernest Petter, who retired after holding office for two years.

WEMBLEY, 1925.

A week has performed wonders at Wembley; and no one could possibly in a single day see all that there is to be seen, though it appears to be generally agreed that large numbers of people have so far kept away by rumours of unreadiness. This is a mistaken attitude to adopt; for just now—when everything is perfectly new, when the grounds are a dream of beauty and freshness, and when the summer rush has not yet begun—is an excellent time to select for a visit. There is plenty of room to move about—too much, perhaps, may be the visitor's first reflection on entering, failing to bear in mind the vastness of the place. As a matter of fact, favoured by the glorious weather of last week—real Wembley weather, bright but not too hot—there had been, one gathered on Friday, up to that date at any rate, greater attendances than for the corresponding days last year. This is good augury for the success of Wembley, 1925. What the authorities desire should be inculcated in the Londoner is the "Wembley habit." Success in this respect would spell success to the Exhibition; for Wembley is within reach of a population of millions. With regard to the character of the attendances recorded, one learned on inquiry at a selling stall that "steady business had been done;" while the reply in connection with a propagandist exhibit was that "the right kind of people have been coming along."

Visits of Royalty.

Including the day of the opening, and a visit last Saturday evening to the spectacular display in the stadium, the King and Queen have already shown how close at heart they have the Exhibition by going to Wembley three times. On Thursday, they made a lengthy tour, and on all hands one hears of their keen interest in everything that they saw. Indeed, pictorial proof of this is to be found in the "Journal" to-day.

While in the Palace of Industry, the Royal Party made a full inspection of the Gas Exhibit; and here the King gave gratifying evidence—by a reference to the "Seven Ages of Woman"—of the lasting impression he had gained of last year's display.

Press View of the Gas Exhibit.

The Gas Exhibit was spic and span on Friday, when it was visited by a large number of representatives of the Metropolitan and Provincial Press, who were received by Mr. F. W. Goodenough, Mr. W. M. Mason, Mrs. M. A. Cloudesley Brereton, and others officially connected with the Exhibit. Among those present was noticed Alderman George Clark, J.P., M.Inst.Mech. E., a Past-Chairman of the Society of British Gas Industries.

The visitors appeared to be remarkably pleased with all that they saw in the Exhibit. This was only natural, for good as last year's arrangements were, the Gas Exhibit Committee and their Architect (Mr. H. Austen Hall, F.R.I.B.A.), and everyone responsible for carrying out their wishes, have on this occasion beaten their own record. A full description of the Exhibit will be found on pp. 458-460 of last week's "Journal," but the completed display is brighter and more live than it would be possible for any formal written description to indicate. In the Overseas Dominions Hall, in particular, there is a marvellously artistic effect—as one of the lady members of the party remarked, "the beauty of the setting of the Exhibit is perfectly wonderful." In a sentence, it has been appreciated that the arrangement of exhibits is an architectural problem which has to be dealt with in an architectural way; and Mr. Austen Hall has succeeded to a remarkable degree in doing this. While mentioning names of those responsible, omission must not be made of the contractors to the Committee, Messrs. Osborne and Co., of No. 2, Grafton Street, Bond Street, W., who naturally pride themselves on the results of their work.

In the case of the sight-seeing visitor, to look at one of the prettily-executed little scenes depicting the multifarious services of gas in the homes of the Empire, means to make an inspection of them all. The present or prospective gas consumer, domestic or industrial, will find examples of what is best in the way of apparatus for its utilization; while the housewife, desirous of gaining more knowledge with regard to cooking generally, or of one particular branch of it, will find herself immeasurably better off than was possible in 1924, owing to the great improvement effected by the provision of a separate quiet hall, 50 ft. square, devoted to frequent practical lectures and demonstrations.

Ask for Empire Products.

And more than cookery lectures with practical illustrations—highly important as these are to the home-life of the people—is to take place in the Demonstration Hall connected with the Gas Exhibit. Mention was made last week of the fact that a series of Empire food demonstrations is being organized to show that the Empire produces almost every kind of food that the consumer can require. There will be shown, not only a wide range and variety of Empire products, but the best and most economical ways of preparing them for the table. The object of these demonstrations is to familiarize the British public with the food products of the Motherland and Dominions and Colonies; and, in indicating their country of origin and the various ways of preparing them, to illustrate the almost limitless variety of food products within the Empire and the economic advantage of using them.

The Gas Exhibit Committee have promised to place all necessary plant and a staff of trained demonstrators at the disposal of the Empire Food Demonstrations Committee, on which the Women's Section of the British Empire Exhibition, the Fellowship of the British Empire Exhibition, the British Women's Patriotic League, the Empire Food Campaign, and the British Producers' Organization each have a representative. It is intended to give four cooking demonstrations each day, preceded by a short talk upon the nature and origin of one of the products to be used and the wholesale distributive agencies where it may be obtained. It is hoped to include every Empire food product, and to illustrate to the general public all such foods which are, or should be, available to United Kingdom markets. The British housewife who purchases Empire food products combines household economy with the exercise of a proper Imperial sentiment.

Ashtead Potters.

Another thing the Gas Exhibit Committee have done, which will meet with approbation far beyond the confines of the gas industry, is to provide space for a very interesting show of pottery-firing by the disabled ex-Service men employed by the Ashtead Potters, Ltd., Victoria Works, Ashtead, Surrey. Readers may be reminded that Sir Lawrence Weaver (Director of United Kingdom Exhibits) is Chairman of this undertaking, which it is hoped to make a permanent industry that will keep the men employed for the rest of their lives. All the profits (if any) will go back to the men employed; so that those making purchases of any of the pretty little articles on show in the Gas Exhibit will be supporting a thoroughly good cause. The Queen showed in a practical manner that the things on view met with her approval.

"Delaygue" Refrigeration Plant.

Another "working" display for which visitors to the Gas Exhibit—particularly during the week-end hot spell—have been manifesting a strong partiality, is the "Delaygue" refrigeration plant, the patents for which are owned by Refrigeration Developments, Ltd., of No. 86, Grays Inn Road, London, W.C.; the sole manufacturers for the British Empire being Messrs. H. J. West & Co., Ltd., of London and Saxilby. These appliances can be had in small sizes designed specially for ordinary household use, which are capable of keeping an average-capacity safe at a temperature of 38° Fahr. for 24 hours or more. The apparatus works on what is known as the absorption process; but no elaborate heating apparatus is necessary. At one heating—which takes about 45 minutes over a gas ring—approximately 3 lbs. of ice or 8 lbs. of ice cream can be obtained. The machine can be used indefinitely without recharging; so that the running cost is confined to that of the gas consumed for heating. The liquid employed is capable of giving off a large amount of refrigerating material by means of the application of a very small quantity of heat.

At the Sign of the Jolly Jack Tar.

There has been an addition to the British Road Tar Exhibit of the National Gas Council in the Chemical Section of the Palace of Industry. The photograph reproduced on p. 465 of the "Journal" for the 13th inst. showed the tar-macadam road passing round "The Jolly Tar" inn; but it revealed only a few minor branches of an apple tree in full blossom, which is to be found in the opposite corner of the exhibit. This tree, with a wooden seat surrounding it, imparts a delightful countryside touch to Mr. Norman Wilkinson's work; and now this effect has been heightened by placing on the tree two singing birds, which attracted the attention of the Queen during her visit last Thursday. Recording the incident, "The Times" said that Her Majesty "was surprised to find that art had simulated Nature so perfectly." The "Evening News" also had something to say on the matter: "A call was made by their Majesties at 'The Jolly Tar'—a house got up to look like an old English hostelry. The only fluid it contains, however, is tar used in road-making—not a suitable beverage for a day like this! What drew the notice of the Queen particularly was a pretty tree of apple blossom in the yard of 'The Jolly Tar.' Birds were singing in this tree quite sweetly. They are artificial, and the Queen expressed wonder at the close imitation of Nature."

The serious side of this display on behalf of "British Tar for British Roads" would, from all accounts, appear to be no less successful than its purely artistic side.

Glenboig Gas Retorts.

One of the displays in the Palace of Housing and Transport in which "Journal" readers will have a special interest is that of the Glenboig Union Fire Clay Company, Ltd., of Glenboig, and No 48, West Regent Street, Glasgow. They make special bricks for retorts and coke ovens, and claim that Glenboig fireclay is peculiarly fitted for the manufacture of gas retorts—being capable of resisting the highest heats, and combining with this characteristic the equally important quality of resisting sudden changes of temperature in a peculiarly high degree. Every detail is carefully considered by them, with a view to the production of retorts fitted to resist the higher temperatures and the more severe tests to which they are subjected in the modern

VIEWS OF THE GAS EXHIBIT.

In the Palace of Industry, British Empire Exhibition.

[Photo. John H. Avery & Co.

[Photo. John H. Avery & Co.

systems of gas making. The Company claim to be the largest manufacturers of gas retorts in Great Britain; and that Glenboig bricks have long been famous is proved by the fact that two highly appreciative references to them are to be found in Vol. I. of "King's Treatise on the Science and Practice of the Manufacture and Distribution of Coal Gas," which was published many years ago.

Die Casting by Gas.

Mention was made in last week's "Journal" of the fact that the Monometer Manufacturing Company (1918), Ltd., of Bridge Street, Barrow-in-Furness, and Savoy House, No. 115, Strand, London, W.C., are in the Palace of Transport, again showing examples of their gas-consuming industrial appliances. Among these is their patent pressure die casting machine, which is made in one standard size.

The capacity of the pot is 200 lbs. of white metal, the plunger displacing 40 lbs. at each stroke; and the machine can deal with any metal with a melting-point up to 1000° Fahr. The machine is complete in itself, and only requires to be connected up to a 1-in. town gas main—no fans or blowers being required. The temperature of the metal is controlled by means

[Photo. John H. Avery & Co.

HER MAJESTY THE QUEEN INSPECTING MANTLE MAKING.

Lighting Trades, Ltd., have this year installed machinery for the making of gas mantles. The exhibit is situated in Nobel Hall, Bay E, Palace of Industry; and it is attracting considerable attention.

of a patent heat regulator, which prevents it from overheating and burning. This regulator is adjustable to any temperature, and once set requires no further attention. The "Monometer" die caster has a patented mixing device at the bottom of the plunger, which prevents the accumulation of the heavier metal at the bottom of the pot, at the same time ensuring a homogeneous alloyed casting. The melting pot is interchangeable; and there are no valves or other complicated working parts on the machine which might cause trouble. Owing to the design of the plunger and gearing, a big pressure can be obtained, which enables very intricate and thin close-grained castings to be made.

PHOTOGRAPHY BY THE LIGHT OF HIGH-PRESSURE STREET LAMPS.

Through the kindness of Mr. R. S. Ramsden, General Manager and Engineer of the Leamington Priors Gas Company, the permission has been obtained of Mr. W. Walden Hammond (also of Leamington) and the Editor of the "Amateur Photographer," to reproduce in our pages the above interesting photograph. The title of the picture is "Our Parish Church—Night." Mr. Hammond informs Mr. Ramsden that, when the photograph was taken, there was no moon, and the only light was that of the high-pressure incandescent gas-lamps on the tramway standards and that from the shop windows on the Parade. The block was placed at our disposal by the "Amateur Photographer"; and we thank them for their courtesy.

Small Stations at the Pithead.—Where a town is closely situated to a colliery, there is perhaps greater reason for a generating station being constructed there sufficient for its supply than for a super-station to serve many towns and generally over a large territory. In the former case, the question of condensing water, transmission costs and losses, safety, and reliability would not be so important as in the latter. The Workington Electric Power Company have built a station at the St. Helen's Colliery, Siddick, near Workington; and it appears to be a joint enterprise on the part of the Company and the Corporation. The former have spent upon it £40,000, and the latter £8000, whereas, had the Corporation carried out a scheme of their own, an expenditure of £50,000 would have been entailed. It is stated that the Corporation are going to receive current at a price which would not have been possible save for the utilization of what was formerly waste heat, but is so no longer. We look forward to hearing further particulars of the working.

PNEUMATIC HANDLING AND REVIVIFICATION OF OXIDE.

Simon Plant Installed at Nechells Gas-Works, Birmingham.

It has been abundantly proved by practical experience with a pneumatic plant at the Beckton Station of the Gas Light and Coke Company that spent oxide is definitely improved and revivified in the process of being handled pneumatically. As a matter of fact, at Beckton, material has been returned to the boxes within 24 hours, with satisfactory results. Mr. W. B. Leech, the Engineer at Beckton, has stated that the saving effected by the pneumatic plant over the old method of handling and revivifying oxide is in the neighbourhood of 2s. 6d. per ton.

It is not surprising, therefore, to find that other gas undertakings are adopting the pneumatic system of oxide handling; and Messrs. Henry Simon, Ltd., who were responsible for the plant at Beckton, have carried out several similar installations for gas companies, and have just completed the erection of a pneumatic oxide handling plant for the Birmingham Corporation at the Nechells Works. This plant has been installed in connection with a scheme for additional purifiers, which has recently been completed, and has been arranged to deal with the spent oxide from these new boxes.

The method of operation is simple, and the plant has been so arranged that it can be moved under its own power to any desired point on the various purifier floors. The floor space available over the new boxes for spreading out the spent oxide is 57,000 sq. ft.; and the whole of this area is reached by the pneumatic plant by means of rail tracks and turn-tables. The oxide, after passing through the pneumatic plant, can be delivered to any part of this floor by means of portable blowing-pipe connections. The spent oxide is lifted from the boxes by means of travelling grab cranes, and dumped into a feeding truck which is a separate unit of the pneumatic plant. From this truck the oxide is loaded on to an inclined mechanical conveyor which carries it to a hopper arranged above the disintegrator, and thence to the disintegrator itself, where the oxide is reduced to the desired degree of fineness. The powdered material falls from the disintegrator outlet into a rotary seal, which releases the oxide without leakage of air, and passes it into steel pipes, through which it is carried by a stream of air under pressure to the desired point, and there blown out on to the purifier floor. The plant has a nominal capacity of 10 tons per hour. The oxide is thoroughly aerated during this process, and complete revivification is obtained in a short period. The oxide, being subject to violent bombardment from the air stream during its passage through the pneumatic pipes, arrives at the point of delivery with the oxidization process more or less complete, and in a fit state for early return to the purifier boxes.

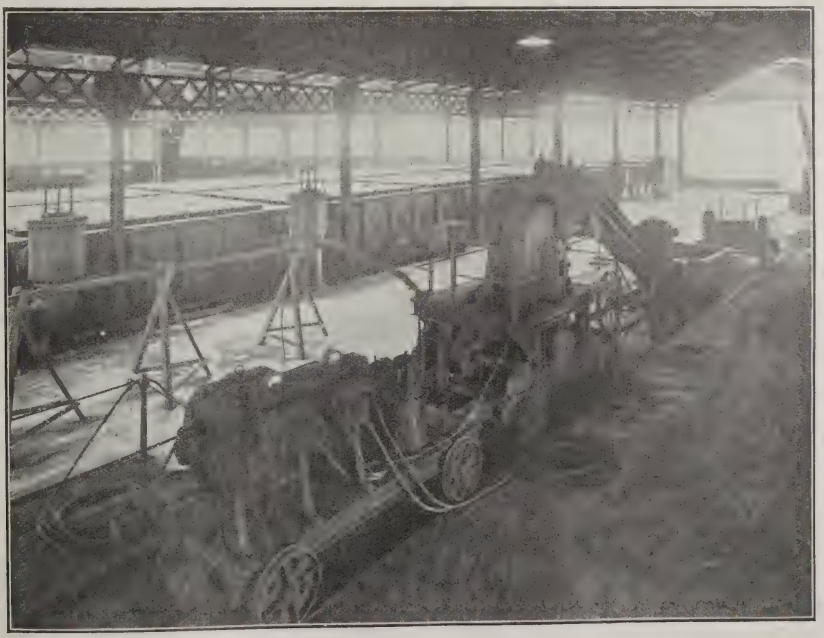
Carrying and hand spreading of the oxide is entirely obviated—a very valuable saving in labour thus being secured. The pneumatic pipe from the plant is supported on portable wooden trestles, and is provided with quick-coupling joints permitting additional sections of piping to be added easily and quickly, as required.

The pneumatic plant itself, the inclined conveyor, and the feeding truck are mounted on flanged wheels, and are arranged to travel on rail tracks which have been laid along each bay of the purifier floor. Turn-tables and cross tracks have also been provided at one end of each bay, so that the plant can be transferred from one bay to another.

The feeding truck and the loading conveyor are moved by hand, while the pneumatic plant itself, which is mounted on two trucks, is propelled, *via* suitable gearing and chain drives to the wheels on the rear truck, by an electric motor mounted on this truck. It is therefore a comparatively simple matter to move the plant to any desired position on the extensive purifier floor.

The disintegrator, rotary seal, and the motor for driving this portion of the plant are arranged on one truck; and the blower, the motor for driving it, and the starter are fitted on another. These two trucks are coupled-up, and are connected by a flexible pipe from the blower to the regulating valve below the seal. The disintegrator is of the Barry Henry type, running at 400 r.p.m., and reduces the oxide to a coarse powder. The pneumatic seal serves as a means of introducing the oxide into the air-tight system of the plant, and is of the rotary or paddle-blade type. This seal is so arranged that there can be no leakage of air when the oxide is passing from the disintegrator to the pockets of the seal. A relief pipe is fitted on the top, connecting with the atmosphere.

The rotor has a number of radial vanes dividing it into pockets, which fill in turn as they pass under the inlet port opening at the top. The pockets are released from the pressure of the delivery side on their way between the two openings in the casing by means of an escape pipe, so that there is no tendency to blow back when a charged pocket comes opposite the delivery opening in the casing. The material simply falls by gravity into the regulating valve. A regulating valve is provided below the seal into which the oxide falls after being released, and where it meets the incoming air under pressure. The blower is of the centrifugal type with an arrangement of balancing rings which limit the friction on the inner surface of the machine. The blower runs at 550 r.p.m., and is automatically lubricated by a small pump arranged at the end of the machine. At the outlet end of the blower is fixed an air receiver which carries a relief valve and pressure gauge. The suction end is provided with a filter which is specially coated to prevent dust getting into the interior of the blower. The motor is of the 3-phase type, 35 B.H.P., and is dustproof. The starters are of the usual oil-immersed pattern provided with "no load" and "overload" release. The motor carries a raw-



SIMON OXIDE PLANT.

hide pinion which engages with a machine-cut cast-iron wheel driving the blower.

The portable inclined conveyor is provided with its own motor and starter, and slip clutch on the motor. Flexible leads are provided to bring the current to the plant; and these are connected to plugs arranged at suitable points along the purifier floor. The arrangement of the plant is compact; and the handling and distribution of the oxide is carried out expeditiously and satisfactorily and with a minimum of labour.

The plant was designed, constructed, and erected by Messrs. Henry Simon, Ltd., of Manchester, who have specialized for some years in the pneumatic system of handling granular materials. It was mainly owing to the suggestions made by Mr. E. B. Tomlinson, Engineer of the Nechells Works, that the plant was made portable; and the increased effectiveness thereby secured has proved that his idea was a correct one.

CHARTERED INSTITUTE OF SECRETARIES.

Conference at York.

The Chartered Institute of Secretaries, of which Mr. James W. Slack (Managing-Director of Radiation, Ltd.) is the President, held their fourth annual conference on Thursday and Friday, May 14 and 15, at York—the North-East Coast, Sheffield and District, and West Yorkshire Branches taking a prominent part in the proceedings.

The business of the conference, in the Council Chamber of the Guildhall, was opened by an address of welcome which, in the absence of the Lord Mayor, who is in the United States, was delivered by the Sheriff of York (Mr. S. R. Slack). A paper on "The Position of the Secretary in the Industrial Triangle," by Mr. J. B. Bardsley, F.C.I.S. (Vice-Chairman of the Sheffield and District Branch), and Mr. Slater Wills, F.C.I.S. (Member of the Sheffield and District Branch Council), was read by the latter. The discussion upon it was comprehensive and animated. Mr. W. G. Hislop, of London (Member of the Council) and others, in the course of their remarks, dwelt upon the circumstance of the Secretary's potentialities in materially assisting the promotion of an improved understanding between the employer and employed. He had, in the rôle of mediator, many opportunities of exercising, by tact and judicious conduct, an influence for good, the important result of which could not under present industrial conditions be overestimated. The President pointed out that a trusted secretary enjoyed the respect and esteem of his Board, the staff, and the operatives. By reason of his personally disinterested position, he had opportunities of directing policy towards wise decisions, culminating in the happy relationship of all concerned in the welfare of the undertaking. The application of these principles to British industry generally would go a long way towards the restoration of industrial peace—a consummation of vital moment to the country's best interests at the present moment.

In the afternoon the Lady Mayoress, accompanied by the Sheriff of York, gave a civic reception at the Mansion House; and the conference dinner was held at the Station Hotel in the evening. Among the guests were Mr. Albert Procter (the Chairman of the York Gas Company) and Mr. H. E. Bloor, B.Sc., B.Eng. (Engineer, Manager, and Secretary); Alderman J. H. Waddington, J.P. (Mayor of Halifax and Chairman of the Gas Committee); Mr. Walter T. Dunn, M.I.Mech.E. (Secretary of the Institution of Gas Engineers and a Member of Council of the Institute); and Mr. T. P. Ridley (Secretary of the Newcastle-on-Tyne and Gateshead Gas Company). The Secretary of the Institute (Mr. C. H. Carpenter, C.B.E.) was, as usual, looking after the comfort of all, not only at the dinner, but throughout the proceedings of the conference. The toasts at the dinner elicited some excellent speeches. After the Loyal Toasts had been honoured, "The Chartered Institute of Secretaries" was given by the Sheriff of York. His remarks contained very appreciative references to the position of the Institute and the important work which it was so well accomplishing. The President acknowledged the toast, and expressed gratification at the progress being made in every department of the Institute's activities. Col. W. Parker, D.S.O. (Member of Council) proposed the toast of "The Visitors," which was responded to by the Mayor of Halifax in an amusing speech, and by Alderman E. Walker, of York.

On Friday morning the conference was resumed by the discussion on "Reserves and Reserve Funds.

Continental Union Gas Company, Ltd.—The Directors announce that an interim dividend of 3½ p.ct., less tax, will be payable on July 4 next on the preference stock, on account of the year ending June 30, 1925.

Allen's "Commercial Organic Analysis."—Messrs. J. & A. Churchill have published a new edition of this work, which has been fully revised and in part re-written. The sections on anthracene and naphthalene contain the latest methods of testing the crude and refined products in use commercially at the present time. The price of the volume is 30s. net.

OBSERVATIONS ON CALORIFIC VALUE AND GAS TESTING.

By B.Th.U.

[Communicated.]

Many recent papers and discussions have shown a widespread feeling that gas should be supplied of constant calorific value, composition, and pressure. It is voiced by men engaged on both the manufacturing and distribution sides of the industry, not merely so as to improve present conditions, but to equip the industry better for the more aggressive attack on the heating field—and particularly the industrial field. Given the *desiderata* named, specific gravity would be constant—that aspect which has only come into prominence in recent years in connection with the correct functioning of appliances.

The whole gamut of uniform calorific value, composition, and pressure is a big order; it can hardly be delivered, at least throughout the country, for many years yet. The industry must go one step at a time. Past history shows that caution has been a predominant characteristic, and to it much of the present prosperity is due.

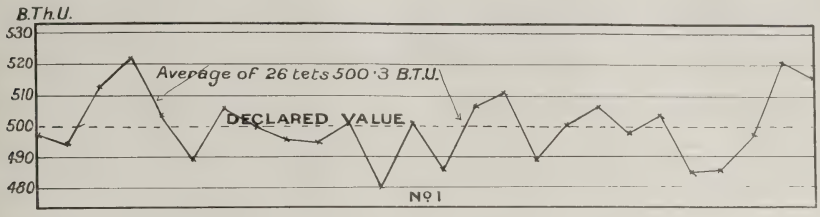
In the report given in the "Journal" for May 6 last of Mr. C. Bryan Donkin's paper "Gas for Industry," and the discussion which followed, Mr. J. Wilkinson, of Nottingham, raised anew the question of uniform calorific value. Mr. Wilkinson apparently doubts the wisdom of the present individual freedom given to undertakings of declaring that quality which best suits local circumstances; for he is reported as saying: "I am not at all sure that the time has not arrived for giving serious consideration to whether a uniform calorific value throughout the whole of the country would not ultimately be in the best interest of the gas industry." If there were no conflict between this ideal and financial considerations, &c. (as to which we need not enter into detail here), it might be readily conceded that the member who interjected "Hear, hear" was justified, not merely in his assent to the suggested consideration, but also to the implied belief that a uniform calorific value would be beneficial.

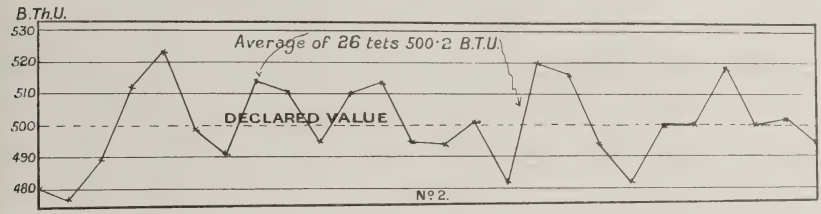
But is uniform calorific value the first step in the order of progress? If it were already attained, the other physical contingencies referred to would be less difficult of realization; one factor in the compound problem would have been removed. It seems, however, hardly a proposition to be seriously entertained until all gas undertakings have learned to maintain uniform calorific value at the respective declarations which they have already made. In other words, before general uniformity is put up for settlement, it is mete that individual uniformity should be determined.

Since the Gas Regulation Act, 1920, came into operation, about 570 undertakings in England, Wales, and Scotland had applied for and obtained Orders under section 1 up to Dec. 31 last. Out of this number over 80, or about 14 p.ct., had revised their declarations; and in a few cases there had been more than one revision. The cause of revision has probably been either (1) a recognition that the original declaration was not a true reflex of existing working, or (2) modifications in plant resulting in a different calorific value being the most convenient to manufacture. Whatever the cause, the convenient flexibility of sub-section 4 (*b*) of the 1920 Act, which gives power of alteration, has received substantial support in so large a percentage of amendments.

Under the Regulation Act, provision is made for independent testing of the gas; and gas examiners have been appointed to discharge these duties in the great majority of areas now supplied under section 1. The prescriptions drawn up by the Gas Referees provide that the gas examiner shall issue a quarterly report of all the official testings made, and "no average calorific value shall be reported for any less period than a quarter." Thus the figures which are published afford no indication of the fluctuations which may have taken place during the quarter. It is seen from the reports appearing in the Technical Press that many undertakings have come very close indeed to the declared value in the quarterly averages. A superficial observer might assume from this that individual undertakings, though not obliged to supply at a "national" calorific value, were able to supply, and were actually supplying, uniformly at the "local" value. But in actual practice this is far from the case, especially where daily official tests are not made. A 6 p.ct. deficiency is allowed before penalty arises for not supplying according to declaration; and so long as an undertaking keeps above that minimum, there will be no publicity of deficient tests. The item "Number of days on which the calorific value was deficient by 6 p.ct. or more," on the quarterly report sheet, will be followed by a "0."

Assume an undertaking gets down to 471 and, *per contra*, for equalization purposes, goes as high as 529 on a declared value of 500 B.Th.U., there is a variation (calculated on the declared value) of nearly 12 p.ct. The writer makes no point of whether or not such a variation is desirable. As it is one allowed by the prescriptions, it may be assumed that, so long as it is no more than 12 p.ct., the interests of the public are held to be fairly safeguarded. Here follow the actual official tests of an undertaking made over two consecutive periods, put in graphic form:





It will be seen that in No. 1 the variation is from 522 to 80 B.Th.U., and in No. 2 from 524 to 476 B.Th.U. Moreover, there is much jumping up and down, both graphs having many peaks and depressions. The graphs refer to an undertaking which would be classed as "medium to large," and one that is under excellent management. It is safe to assume that, were we permitted to enter the archives of the Gas Registrees and look at the quarterly reports of other undertakings, we should find that there were many of which these graphs are typical.

Implications of Considering General Uniformity.

Now, if the question of the desirability or not of imposing on the gas industry, voluntarily or otherwise, a uniform standard of calorific value throughout the country is to be discussed, it follows as a natural sequence that the first thing a gas engineer or manager must do is to look at his own performances in the direction of uniformity. It follows, too, that what the gas industry has achieved in its effort to comply with official control will come-up for examination. The future can only be prescribed for by regard to what has been accomplished and shown to be practicable in the past.

It is worthy of consideration as to whether gas undertakings are prepared or willing to have more publicity in connection with official tests—*i.e.*, publicity in greater detail. It is not difficult to see that, should a fairly general feeling be declared in favour of uniformity of calorific value throughout the country, one of the things that would precede its attainment would be more public information as to the quality that is already being supplied. This publicity would focus more and more the eyes of the consumers on the gas undertaking. It is conceivable that what is now a tolerable statutory injunction would become nothing more or less than a whip in the hands of pertinaceous consumers with which to belabour the gas undertaking.

If general uniformity were agreed upon, would the uniformity be based on a standard with a 6 p.ct. margin either way? The rejoinder at once is that this is no guarantee of uniformity. Mr. Wilkinson spoke of the margins of 280 to 360 B.Th.U. These figures in their nakedness are very far from fairly reflecting the real position. They give the impression that quality ranges to-day by 100 p.ct. upon the lowest figure. As a matter of fact, there are only four undertakings which have a lower declaration than 400 B.Th.U. These are as follows (annual sale in million c.ft. in brackets): Bungay, 360 (7); Goring, 320 (18); Nuneaton, 280 (119); and Scunthorpe, 375 (112). In considering the general proposition, these undertakings are negligible, totalling no more than 876,000 therms altogether. There are only 56 undertakings, including these four, with a lower declaration than 450 B.Th.U., and 13 of these are in Scotland.

There are 24 undertakings with a declared value of over 500, but not exceeding 560 B.Th.U.; and one, Lampeter, which has declared 600 B.Th.U., and sells less than four millions. Thus, of the 570 undertakings with declarations at Dec. 31, 1924, nearly 500 already declare at between 450 and 500 B.Th.U., and of these actually 160 have declared at 500 B.Th.U. It is an exercise for which the writer has not the inclination, but which might tempt a statistically-minded reader, to calculate from the individual declarations what proportion of gas this 500 B.Th.U. declaration represents on the total. As it includes the Gas Light and Coke Company, it must be in the neighbourhood of 50 p.ct.

When the figures are fully examined, it is probable that they will reveal a much closer approximation to uniformity than superficial consideration leads one to think. If a range of 50 B.Th.U. were taken (say 440 to 500 B.Th.U.) it would probably be found that 70 to 80 p.ct. of the gas sold under section 1 is already within it.

Does the question, then, not boil-down to this—that if undertakings will successfully strive to keep the quality at the declared figure, uniformity to a greatly preponderating extent will have been accomplished, without any tinkering with the present legislation, or provocation for tinkering? If Mr. Wilkinson had in mind no more than a "consideration" having for its object the peaceful persuasion of gas suppliers to deliver at a uniform quality, that "movement" can achieve a great deal, if it produces close synchronization between the supply line of quality and the line of declared value. Even before that can be urged to the full, there is another "movement" overdue—that of those municipal undertakings which have so far elected to remain outside the fold of the Gas Regulation Act, getting inside. On a point of urgency, this takes distinct priority over the question of a uniform calorific value. Until these undertakings come in, and declare what quality they can most conveniently supply, it is not possible with completeness to test the measure of present dis-uniformity.

Qualifications of Gas Examiners.

No steps have been taken as yet to enforce a standard of qualification in persons who are appointed to gas examinerships. The attainments of those who are appointed vary widely, as also the remuneration for the duties performed. Those who make appointments are guided merely by an exhortation to appoint only qualified men, without any indication as to what qualifications to look for. There are examiners with so many appointments that it is a wonder how they are able to do justice to all of them. It is a matter for consideration whether some closer regularization cannot be given to persons who are entrusted with so important a matter as reporting on the quality of the gas supplied under statute. The Metropolis is reputably well served. It is in the Provinces that wide disparity exists.

In conclusion, the summarized position seems to be that, if the gas industry can be assured that throughout the country the gas is being efficiently tested with reliability, reflecting the true quality, and can keep at all times closely to its declared value, the case (if there is one) for general uniformity, or one common quality, will, in the writer's view, be found to be considerably weakened.

Distribution Conference in America.—In connection with the American Gas Association, there has been arranged a two-day distribution conference, which will take place in Detroit on June 11 and 12. The purpose is to afford distribution engineers an opportunity of discussing vital problems; and various pressing topics have been selected for consideration.

The Industrial Gas Field.—The Survey Committee of the American Gas Association have been considering the data which will be embodied in their report to be presented at the convention in October. In connection with their work, the Committee are preparing data on all of the gas properties in the States of New Jersey and New York, showing the gas sales for the year 1924, divided into domestic and industrial sales, and the percentage of sales and revenue in each class to the total business. These data will be summarized in the classes of business, indicating the amount of potential business available in 1000 c.ft. of gas, and the rate necessary to secure the business. The idea is to show that, if gas utilities were securing this business and displacing other fuels, the industrial gas sales, instead of being from 20 to 25 p.ct. of the total gas sold, would amount to from 40 to 60 p.ct.

"B.C.G.A." SOUTH-WESTERN DISTRICT CONFERENCE.

REPRESENTATIVE ASSEMBLY AT MINEHEAD.

THE South-Western District of the British Commercial Gas Association held a conference at the Plume of Feathers Hotel, Minehead, on Friday, May 8. The chair was taken by Mr. J. H. ELLIS (the President of the Association, and Chairman of the Plymouth and Stonehouse Gas Light and Coke Company). Not only were delegates present from the majority of the gas undertakings within the area, but an equally satisfactory feature of the attendance was that all sections of the industry were adequately represented—the size and character of the gathering being regarded with extreme satisfaction by the Directors, shareholders, and officials of the Minehead Gas Company, who were the hosts for the day.

Mr. JOHN BURGESS, J.P. (Chairman of the Minehead Gas Light and Coke Company, and the Minehead Urban Council), welcomed the members in the name of the Council and the Company. He was sure the conference would be helpful to them in the exchange of ideas, which was so essential to efficiency in the control and management of gas concerns. Minehead was a most prosperous town; and taking into consideration the population and the rateable value, he thought it had made greater progress since the war than any other place in the country. The Gas Company were progressive, and the output of gas had increased every year for a considerable time—even during the war. He congratulated Mr. Ellis on his election to the Presidency of the "B.C.G.A.," and said those who had had the pleasure of listening to him in different parts of the country must feel that he was the right man in the right place. He was expressing this appreciation on behalf of the Directors of the Minehead Company, but he might go further, and say it was an opinion fully shared by everyone in the Association. [Applause.]

PRESIDENT'S ADDRESS.

The PRESIDENT said he took what had been said of him to belong more properly to the organization of which he had the honour to be the head. The policy of the "B.C.G.A." was to encourage those conferences for the interchange of views and experiences, for the benefit of the industry. The one purpose which animated them all was to serve the public honestly and well, and to give those on whose support they depended the best value for their money—not merely in the cheapness of the commodities they supplied, but in the brightness and comfort of their homes, in the removal of domestic drudgery, and in the purity of the atmosphere of the towns which the extended and extending use of gas brought.

Perhaps he might call attention to the results of this policy, as revealed by the following figures:

Output of Gas in the British Isles.

Last year	281,874,000,000 c.ft.
The year before	269,602,000,000 ,,
Increase	12,272,000,000 ,,

Number of Consumers.

Last year	8,502,069
The year before	8,406,172
Increase	95,897

Cookers and Grillers Supplied.

Last year	5,450,093
The year before	5,133,190
Increase	316,903

The outlook of the Association was world-wide; and while there were many respects in which the Americans might with advantage follow us, there were others in which we seemed to be travelling along the same road, and some where we might profitably follow them. High-minded competent administrations on both sides of the Atlantic were agreed it was their duty, as well as their interest, to minister to the public well-being. In pursuit of this object, they must be candid and frank with their customers (the public); and they must never tire of giving the wildest circulation in the Press, on the platform, in exhibition halls, and in their offices, to the benefits which followed the happily increasing use of gas in streets, factories, and homes. Let them be careful to tell the truth not merely about themselves, but also about their competitors. For years he had been associated with both gas works and electricity works, and the successful conduct of each was mutually advantageous. Not only so, but extended experience convinced him that if both were more often in the same hands, as they were in some places, they would be administered more to the public advantage than was frequently the case.

Dealing with the suggestion repeatedly made that the Government should subsidize electricity, the President asked, "Was electricity in such a bad way as that?" Figures were given showing dividends from 10 to 15 p.ct. on electrical undertakings. How many gas undertakings were allowed to pay such dividends as those, and what sliding-scale that was ever thought of would permit them? Members of Parliament with whom he had talked on that subject said it was only intended to subsidize water-power schemes, such as the Severn. Did they suppose, if the present Government or any other Government were guilty of the injustice of taking their money or speculating with it on the Severn or similar ventures, they would ever have a farthing of principal or interest, or would get electricity a farthing a unit cheaper than they would obtain it from the electricity company, or than Mr. Vince (the Manager of the Minehead Gas Company) could produce it for them by a gas engine? He suggested that everyone present should ask his Member to be on his guard against any insidious proposal made, and to resist it. Let them depend upon it that, if they were vigilant, the public would see to it that injustice was not done to the thousands who depended on their industry for their livelihood.

At the invitation of Mr. W. N. WESTLAKE (Exeter) seconded by Mr. S. J. INGRAM (Truro), the conference accorded thanks to the President for his address.

PUBLICITY WORK OF THE ASSOCIATION.

Mr. W. M. MASON (the Manager of the "B.C.G.A.") then dealt with the publicity operations of the Association—specially commending the Wembley Exhibition last year as an example of what could be done in the way of advertising. The Association was out to benefit the gas undertakings, and nothing gave those officially connected with it greater pleasure than to be of use. Undertakings had a perfect right to look to the organization to assist them in overcoming difficulties, and to be a help to them in every form of development. He was hopeful regarding the future, both of the Association and of the industry it was seeking to promote, believing that, by all working together, still greater success awaited them. It was by constant and well-directed efforts of the individual units, backed by the whole strength of the central organization, that future triumph could be assured. Never let those present forget that the Association under whose auspices they met that day was their organization, and that its main object and chief purpose was to help in the development, and secure the improvement, of the whole gas industry of the country. He had a strong belief in the value of publicity, and a confident opinion that, if wisely used, it would serve to show, in ever more striking and convincing way, the value of gas to the community in its upward march along the path of progress and civilization. The future was with them, as promoters of this great agency for giving light and heat, if only they seized their chances courageously and went forward without fear.

Mr. EDWIN P. VINCE (Manager and Secretary of the Minehead Gas Light and Coke Co., Ltd.) read a paper, from which the following extracts are made:

LOCAL PUBLICITY AND SERVICE METHODS OF A 50-MILLION WORKS.

It has been said that it is impossible for two lighting companies to exist and pay their way in a town of under 6000 people; but this has not been our experience or that of our competitors. In 1807 we made 8 million c.ft., in 1915 23 millions, and in 1924 over 48 millions. I should like to emphasize the fact that our policy is *pro* gas, not *anti* electricity. Indeed, if there were no electricity available in Minehead, I should not hesitate to recommend my Directors to get power to supply it.

An outline of the method by which we have increased our sales may be of interest to you. First I would like to pay tribute to the excellent organization and officers of the British Commercial Gas Association, the mainspring of the selling side of every up-to-date gas undertaking. I look forward to the day when there will be a 100 p.ct. membership. Those companies who are outside our organization are benefiting by the co-operative advertising; but happily the proportion is fairly low. In most cases they are probably undertakings with a very low standard of efficiency. If they were really keen, they would be members of the "B.C.G.A." as a matter of course. Every undertaking has a duty to the industry as well as to itself—viz., to give a high standard of service.

The greatest asset in developing the sales organization of any industry is the goodwill of the public; and this can only be obtained by persistent, conscientious, and faithful work—viz., service coupled with boundless enthusiasm. We must all realize that, in spite of the general growth of gas sales throughout the British Isles, we have only touched the fringe of the possibilities of gaseous heating and other uses for gas. While there is a single chimney emitting smoke, we must never rest.

Good advertising is a great asset to any business concern, ovided it is backed-up by service; the one is of little benefit ithout the other. Spasmodic advertising, however, is of very tle value, if any. We advertise in our local Press every eek; and the subject matter never appears more than once. e realize to the full that it is one of the greatest essentials effective newspaper advertising that copy should be regularly anged. Furthermore, to be of any value, the advertisement ust catch the eye. To achieve this end, we always have an ustration. The reading matter, which must never be over-owded, is headed by an apt phrase in bold type, and the whole surrounded by a distinctive border. Also we stipulate for a sition over news columns, with no other advertisements near . "White space" advertising, too, we consider to be an ective, if somewhat expensive, method for occasional use, hile a paragraph every now and again in the local news ıdoubtedly has its uses. We always endeavour to frame an lvertisement to educate the public up to the utility of the rticular apparatus referred to; and in this connection I ould like to pay tribute to the assistance we have received ɔm the "B.C.G.A." and also to one of the members of our rical staff, who has shown particular aptitude for the work. ɔod advertising is like the proverbial snowball—at first it ıthers slowly, but later on the result is apparent.

I should like to emphasize the need for every gas company, wever small, to possess a showroom. For several years I rved companies without showrooms; and I can speak from rsonal experience of the difficulty in securing new business hen one can only show to the prospective customer an illustra-ɔn of the particular appliance required. Happily for me, my irectors, at the instigation of the late Mr. Reginald Thomas, y predecessor here as Manager and Secretary, secured good emises as showrooms and offices in the centre of the town; ıd other property has since been acquired for future exten-ɔns to meet our growing business. I say without hesitation at, without these showrooms and offices, it would have been ıpossible to increase our sales as we have done.

Our aim has been to show how gas can be employed to crease the amenities of the home or the potentialities of a ısiness. Having regard to the fact that this is a holiday re-rt, I hope, when our additional premises are available, to -up a section showing the many advantages of gas in hotels ıd boarding houses. There is a real need for this, as one ten finds obsolete and extravagant apparatus in use. A well-ghted showroom window display is at all times a potential ısiness getter, and additionally so if lighted after the usual ısiness hours.

As regards canvassing for new business, it is questionable hether postal canvassing is of much use in a small town. I ink one interview is worth a dozen letters, and certainly is r more satisfactory in the long run. Neither am I impressed ith my one experience of employing a canvasser. The best ısiness getters are a staff who know their work and do it fficiently. I am glad to say my staff introduce a lot of busi-ess, because they are keen on their job. The question of gular inspection of all gas appliances, and testing of installa-ɔns, in order that the highest efficiency may be assured, has ven many engineers cause for thought, and in some cases tion. I am convinced that customers and gas companies ike would benefit by its general adoption. We have not been ble to do this yet, but I hope to see it put into effect.

The enhanced cost of gas appliances since the war makes it ıperative for companies who are not in the position to resume ıeral hire terms to adopt a system which helps an intending ırchaser to have the best and most efficient appliances. Many our clients appreciate, and take advantage of, the facilities e afford them to spread payments over two or three years at very small extra cost—viz., 5 p.ct. for two years or 7½ p.ct. r three years. As we offer to deduct this percentage from the nount remaining unpaid, if at any time a client is in a posi-ɔn to clear the account, it happens in a large number of cases ıat, after a successful letting season, the balance is paid off. bout 500 houses have been erected in Minehead and district nce the Armistice; and the whole of these, with two excep-ɔns, were serviced and piped for gas during the course of ection. The pipes are so arranged that it is possible to have gas fire fixed in any of the rooms. It is obviously good busi-ess to do this.

One of the best advertisements any company can have is ɔod outside lighting of shops. Under our scheme we make a xed charge per lamp for hire and maintenance. This system good for the trader and for the company. Each year since e inaugurated the system we have had the pleasure of gaining ıore business. The effect on the minds of the public through ways having good examples of gas lighting before them ıould not be lost sight of. We have also a fair share of inside ıop lighting, which we do on similar terms. The number of ıtside lamps is 70, and inside lamps 106. In the aggregate ıey afford us an appreciable load.

The domestic servant problem is becoming more difficult very year, and is probably felt to a greater extent in a seaside wn than inland, especially during the summer season. A linehead lady informed me the other day that the board and ages of a good servant in Minehead to-day are equivalent to ;100 per annum, so that, if she could reduce her staff of servants by one, through the adoption of gas for heating and cooking, it would be a profitable transaction for her.

Many of the hotels and boarding-houses here have adopted gas fires with separate slot meters in the bedrooms; and without doubt, as the idea becomes more generally known, this business will increase enormously. In this connection a letter we received from Bournemouth will interest you.

"Boscombe, Bournemouth,
Dear Sirs, *Jan.* 28, 1924.

Will you be so good as to let me know which of the private hotels or board residences in Minehead have gas fires with ring fixed in the bedrooms? I am anxious to visit Minehead early in the spring, and should be glad to know this. I see in one of the guide books that you will be glad to supply this information. We have gas fires in all the bedrooms here, and they are such a convenience to all in the house.—Yours faithfully, &c."

The good use of this letter as the basis of an advertising campaign secured us a welcome increase in this class of business, while many cases of new installations in the same direction have resulted through the personal recommendation of one boarding-house keeper to another.

Much may be done also in the way of educational propaganda. For instance, we are always glad to co-operate in any local cookery classes or competition for adults or children, by offering prizes for cooking by gas. The money is well spent, especially where the children are concerned, for they are our customers of to-morrow.

In conclusion, I should like to point out that a scheme of publicity which might be applicable to one district might not be so well suited for another. Each district must work out its own salvation. Whatever form of publicity is adopted, it is often difficult to trace the business actually resulting; but in the writer's opinion good advertising, backed-up by good service methods, is the *sine qua non* of successful management.

Discussion.

Mr. P. S. Hoyte (Plymouth) enlarged on the value of showrooms, and adduced several arguments to support his view. Without decrying the value of the written or the spoken word, he insisted that practical demonstrations made the greatest impression on the public mind. In showrooms persons could see what no amount of printed or spoken matter could convey. He urged the establishment and maintenance of showrooms, replete with the most modern devices and improvements in heating and lighting by gas. It was the best advertisement any company could invest money in. Such showrooms should be rendered attractive, be made easy of access, and be in charge of an employee who was affable and well posted on all points. Advertise, by all means, in every way possible, by circulars, in the Press, upon the hoardings. Use pictorial matter whenever practicable. But do not suppose that, when that is done, everything is done. In other words, do not forget the showroom.

Other members taking part in the discussion testified to the use and value of showrooms, and several spoke in appreciation of Mr. Vince's paper.

Luncheon.

Later the members were the guests of the Directors of the Minehead Gas Company at luncheon. Mr. John Burgess presided, and was supported by co-Directors and by officers of the "B.C.G.A." At the conclusion, there was one toast—the President inviting the company to drink to "The Chairman, Directors, and Manager of the Minehead Gas Company." He expressed his warm appreciation, and that of the members, of the way in which the Association had been received and entertained that day. Mr. Burgess briefly replied.

The Modern Labour-Saving House.

The afternoon session (open) drew a crowded attendance; the accommodation of the Assembly Room at Newcombe's Café, in the Parade, being severely tested. Ladies greatly predominated in the audience. Home hygiene and its relation to gas, to be expounded by a lady, was evidently a powerful attraction to housewives.

The President, in a few introductory remarks, said Mrs. Robert Noble was known to them as consultant on home hygiene, furnishing, and equipment. The topic upon which she was to speak to them, which she would treat as an authority, was "The Modern Labour-Saving House."

Mrs. Noble said she understood that 90 p.ct. of the population of Minehead used gas appliances, but that still a number of houses detracted from the health-giving attributes of the town by burning coal and adding smoke to the atmosphere. As a delightful resort, Minehead must live up to its reputation for fresh air and sunshine, by offering a maximum of both; and this could only be done by eliminating all the coal fires that vitiated the atmosphere. It seemed a pity that the whole community should be penalized by the few. There were homes so efficiently run and intelligently equipped with gas cookers and gas fires for heating the rooms that, although there was abundant warmth in them, there was no vitiation of the atmosphere by smoke and the products of incomplete combustion. The owners of such houses found the labour of housework so lightened that they had more time for rest, recreation, and leisure. But what happened time and again was that the leisure so won was spoilt. The skies were heavy and overcast, fog and smoke lurked in the atmosphere, and the leisure hours spent out of doors were robbed of part of their health-giving

properties by the smoke and soot rising from the open coal fires of the unenlightened householder. All true housewives should strive to make their own house ideal; and both husband and wife must join forces to bring about these ideal conditions.

The real labour-saving house saved time, steps, and money, and conserved health and energy. The work was better done and in less time, leaving a wider margin for rest and recreation. Thus in a community of real labour-saving homes the citizens enjoyed more ideal atmospheric conditions during their leisure; and they also had a good conscience, knowing that each had honestly done his or her bit to ensure a smokeless city. The intelligent servant welcomed the real labour-saving device that simplified housework. Gas appliances really did save time and trouble by lightening work, by providing adequate hot water, and by supplying a hygienic source of warmth, with a maximum of efficiency at a minimum of cost in both cash and energy.

Many mistresses who could provide their staff with a sitting room found the gas fire exactly met the case. The room was needed at odd times, and it was so easy to light the gas fire for just so long as it was wanted and no longer. In the kitchen, which was the workshop of the home, when gas was intelligently used, the preparation of the meals and the clearing-up after them, the work of washing day and all house cleaning, were considerably simplified. In connection with hot water the coke boiler must also be considered. In every room of the house the story was revealed of how gas helped the housewife to make a real home. From attic to cellar the value of gas appliances and gas fires in promoting the health, comfort, and well-being of the whole household could not be over-estimated.

The President said they were extremely obliged to Mrs. Noble for her address.

Some ladies put questions. One of them asked whether a gas fire in a room helped to promote sociability to the extent that everybody knew an open fire did.

Mr. Vince replied that personally he felt as much sociability under the influence of a gas fire as before an open grate.

Mr. Mason urged the value of labour-saving appliances in the home, as advocated by Mrs. Noble. Their industry happened to coincide with the public welfare. They were offering the public something that was needed, and would help tremendously to solve the problems of the household. In Minehead they were fortunate in having a progressive gas company. Let them go to the showrooms, and they would be surprised at the wonderful service they could get.

The President said, with regard to cooking, everybody was agreed that it was now nearly all done by gas. In Leicester 95 p.ct. of the population cooked by gas; and in Plymouth they had a trifle of 14,000 cookers out. The Gas Company were discontented, however, because 2000 or 3000 of their customers did not cook by gas; and they were giving demonstrations showing how advantageous it was to cook by gas.

Mr. Westlake said that Exeter was extending its houses rather rapidly, and during the last four or five years 95 p.ct. of the new houses had been built without coal ranges being installed. Cooking by gas was looked upon almost as a universal necessity. In Exeter a group of 45 houses had just been completed, and there were no coal ranges in any of them. They had done away with chimneys in the upper storeys altogether, and had put in 9 in. by 3 in. flues, and gas fires in two bedrooms. These had proved so acceptable that they were now being pressed to instal them in the smaller industrial houses.

Mrs. Noble was thanked for her address, on the proposition of the President, seconded by Mr. Burgess.

Gasholder Fire at Pittsfield (Mass.).

Illustrations appeared in a recent issue of the "Intercolonial Gas Journal of Canada" of a gasholder fire at Pittsfield (Mass.). When workmen were on the steel framework of the holder attending to the steam pipes for heating the sealing-water, a film of oil floating on the lower water-seal, from some cause unknown, became ignited. The film of oil was probably very thin, and the flames at first reached a height of only 2 or 3 ft. The burning surface, which was 18 in. wide, extended round the whole circumference of the holder—about 330 ft. This oil fire would doubtless have burned itself out in a very short time, without causing appreciable damage, had it not been for the introduction of complications. The holder was a three-lift one, in a steel tank, and had a capacity of 750,000 c.ft. At the time of the occurrence it was almost full of gas, which was expanded by the heat from the burning oil to such an extent that the holder rose to its utmost height, and the gas then blew out around the bottom water-seal. This escaping gas, of course, became ignited, and further increased the heat, with consequent additional expansion and escape of gas, which provided fresh fuel for the flames. About 200,000 c.ft. of gas was consumed in this way; and at the same time, it is said, the oils which had over a long period condensed out of the gas, and were floating on the surface of the water inside the holder, were forced out, and also caught fire. Any danger there might have been of a collapse of the structure was obviated by keeping the steelwork cool by means of streams of water from the fire hoses constantly playing on the supporting frame.

GAS PRODUCED FROM HEAVY OILS.

The possibility of competition with town gas from gas generated from heavy fuel oils by partial combustion, was mooted in the course of a paper read at the meeting of the London Section of the Society of Chemical Industry on Monday, May 4. The author was Mr. J. E. Hackford, who has been responsible for the technical development of the "Hackol" gas process, in which heavy bunker oils of 0·950 sp. gr. and upwards are contemplated for use. The author pointed out that these oils are not universally satisfactory for use in high-compression engines, and consequently it is not surprising to find that efforts have been made to convert such residual oils into producer gas. Another reason which has influenced this work is the present industrial unrest as reflected in the high prices of coal and freight, which it is alleged has brought about the position that a producer gas made from oil can, under certain conditions, compete in price with producer gas from coal, and can much more successfully compete in price with town gas. As a matter of fact, the author himself, in the paper, did not stress this latter point; and it was left to various speakers in the discussion, who spoke highly of the "Hackol" process, to emphasize it. Under the influence of this favourable criticism, however, Mr. Hackford dealt with it a little more in detail in the course of the reply to the discussion.

Having experimented with furnaces of various types, which have formed the subject of early patent applications, in order to ascertain why these were not so completely successful as might be desired, Mr. Hackford has evolved a generator which relies upon the heat of partial combustion to provide sufficient heat to carry on the cracking process indefinitely. This generator obviates the use of baffles and external heating devices which are more or less common in other types of apparatus designed to develop gas from heavy oils. In this way it has been found that the composition of the gas is maintained constant, as also is the temperature, while the drawback of previous apparatus due to the deposition of coke or asphaltum is also avoided. Gases from 155 to 190 B.Th.U. per c.ft. are generated in this apparatus; and an important feature is that the plant is capable of adjusting itself to the load without material reduction in efficiency, which, according to the type of oil used, has been found to vary between 80 and 93 p.ct.

In the course of the discussion,

Mr. G. W. Anderson said that, while admiring the ingenuity of the work done by the author, it would be interesting to know why so many people who might be expected to use producer gas preferred town gas. Moreover, it was difficult to see why such a round-about process as the author's should be adopted when fuel oil in itself was such an excellent means of obtaining power by direct burning in boilers, engines, or furnaces. Another point which should not be overlooked was the national aspect of purchasing foreign oils for the purpose, when they had at hand in this country so many fuels available for power purposes.

Mr. W. Hesketh said that one of the drawbacks of the ordinary producer gas plant was the large amount of space which it occupied, and he looked to the author's process to overcome this difficulty because an apparatus measuring about 12 in. in diameter by 18 in. long was capable of an hourly production of 5000 c.ft. of gas of a calorific value of 150 B.Th.U. An ordinary producer plant using solid fuel would occupy, for this output, a space of 20 ft. long by 15 ft. wide.

Mr. Koopman, who has been associated with the author more on the commercial side, said that it was possible to produce gas by this process and to sell it at from 2¼d. to 3¼d. per therm, against 6d. to 1s. per therm for ordinary town gas.

Mr. W. J. A. Butterfield suggested that it would be interesting to have some comparative figures of outputs and sizes of plant using the author's process and ordinary producer gas plant.

Mr. Hackford, replying to the discussion, said it was possible to sell this gas at one-third the price of town gas, and at 66 p.ct. less than producer gas, with coal at 24s. per ton. A plant to generate 50,000 c.ft. of gas per hour occupied a space 36 in. long by 18 in. internal diameter, while the subsidiary apparatus would take a space of about 4 ft. square. As the reason why many people who wish to use producer gas to-day, but who used town gas, was that they had not the space to instal the ordinary producer gas plant, he looked for his process to appeal to these people. Commercial plants were now being constructed; and he hoped to have the opportunity of putting forward results from them in due course.

"The Cost of Freight Transport by Railway."—The object of this book, which has been written by Mr. F. W. Rogerson, is to examine the elements of railway operating expenses, and to describe methods of procedure in the development of a cost accounting system, particularly in respect to the determination and application of overhead charges. In view of the activities of the Railway Rates Tribunal, the necessity for correct records of railway operations will be felt in the future to a greater degree than in the past; and reliable data, easily and correctly compiled, will be found of immense service to officials and others. The book is published at No. 27, Pembroke Place, Liverpool; price 4s. 4d. post free.

NDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Annual General Meeting.

ie Annual General Business Meeting of the Association was at the Westminster Technical Institute, S.W., on Friday, 8—Mr. Newton Booth (the President) in the chair.

Financial Statement.

ie Hon. Treasurer (Mr. A. Broadbent) submitted the ncial statement, remarking on the healthy condition of the ciation. They would be able to start the new session with edit balance greater by £10 than at the beginning of the ent year. They had every reason to be satisfied with this of affairs.

ie President proposed the adoption of the balance-sheet. motion was passed unanimously, after being seconded by J. K. Grant, of the South Suburban Gas Company.

Report of the President.

ie President then reported as follows on the working of Association during the past year:

ie Council are pleased again to be able to report a most essful session. You have heard from the Treasurer's state- t that there is a small addition to the credit balance carried ard, and that the Association is in a sound financial posi-

As regards membership, the total number of members at date of the last annual general meeting was 295; and we admitted during the year 22 members. Unfortunately, ever, we have had a rather large loss of membership by gnation, &c.; the total number being 21, leaving us with a ent subscribing membership of 296.

ith regard to the programme for the session, we have again fortunate in securing high-class lectures and papers for our tings, and in having the opportunity of visiting a number orks. On the two short paper evenings, we arranged for papers only, as it was found that there was difficulty in pressing three papers into one evening. The result justified decision; and the evenings were very successful, especially n one remembers that the authors of the papers were mem- who had not previously contributed in this direction to our sactions. The pictorial lecture on the building of the Lea ge gasholder, given by Mr. D. Cleave Cross, was a very yable and most instructive event, as were also the lectures n by Dr. Hartley, Mr. Randall, and Mr. Dean Chandler. thanks are due to all these gentlemen who contributed to proceedings in this way.

ie Association have also been welcomed again at the enham and the Beckton Gas-Works, at the Kingsland Road er Works, and at two works where gas is not the chief est—the East Greenwich Generating Station and the Royal nal. The Council feel that it is in the best interests of the ciation occasionally to visit such works.

ie Council have with regret to inform the members of the gnation of the Hon. Secretary, Mr. Leonard Lacey, and the stant Hon. Secretary, Mr. W. H. Noble. Mr. Lacey has the office for two years with credit to himself and distinc- to the Association, and is relinquishing the position on unt of his more onerous duties in other directions. The ncil deeply appreciate his sterling worth and the services he rendered to them and the Association. Mr. Noble is about eek fresh fields in another hemisphere. His services are ly appreciated; and we thank him heartily for them. At ame time our best wishes will go with him when he leaves Mr. J. H. Goldsmith has kindly consented to take up the es of Hon. Secretary; and the Council trust he will receive whole-hearted support of all the members. It is expected nd a successor to Mr. Noble in Mr. A. Tennant, of the ydon Company.

o far we have been dealing with purely domestic matters; we have other interests. This year we had the honour of ing the Joint Council Meeting of the Junior Gas Associations ondon, at which your President took the chair. The princi- subject discussed was the Education Scheme; and the meet- had the advantage of the presence of Mr. Walter Hole. Junior Council expressed strongly the view that something e was needed than the group courses which had been put ard as the commencement of a course of studies leading o the Institution Diploma, and that it was necessary to with those men who, while requiring instruction in one or subjects, yet, by reason of age or capacity, lack the ability rofit by comprehensive group courses. The point made has its due effect. Our liaison with the Southern Association as Engineers and Managers has been maintained.

'e have still another meeting this session—our summer to Cambridge on June 20. The Council trust that there be a good attendance of members and their ladies.

id now, if I may be permitted a little personal note, I would to say what an advantage it would be to members and to Association if larger numbers attended our meetings and part in the discussions. Not only does knowledge grow by g disseminated, but the advantage to members themselves—cially the younger ones—of the personal touch, and the tice they get of clothing their ideas in spoken words, is great.

In conclusion I would like to thank the officers and Council of the Association, and especially the Hon. Secretary, for the splendid way in which they have helped me during the year, and all members for their support.

Mr. W. R. Moger (Tottenham District Light, Heat, and Power Company) proposed, and Mr. W. E. Brown (Gas Light and Coke Company) seconded, the adoption of the report.

A hearty vote of thanks was passed to the retiring officers and Council for the work done by them during the past year.

Testimonials.

Mr. J. R. Gale (North Middlesex Gas Company) proposed that the following testimonials be presented.

Mr. W. Newton Booth.

This testimonial, presented to Mr. W. Newton Booth, Assoc.M.Inst. C.E., by the Council and Members of the London and Southern District Junior Gas Association, places on record their high appreciation of the services rendered by him during his term of office as President for the session 1924-25.

His wide technical experience, together with his unfailing tact and courtesy, have increased the prestige of the Association.

In expressing their thanks, members trust that he will for many years to come enjoy good health, and continue to render valuable service to the industry.

Mr. A. Broadbent.

This testimonial, presented to Mr. A. Broadbent, on the occasion of his vacating the position of Hon. Treasurer to fill the office of Senior Vice-President, is intended to convey to him the thanks of the officers and members of the London and Southern District Junior Gas Association for his long and devoted service in the former position during the years 1920-25.

They feel confident he will, in the positions he will hold during the next two sessions, continue to merit their appreciation and esteem.

Mr. Leonard Lacey.

This testimonial is presented by the Council and members of the London and Southern District Junior Gas Association to Mr. Leonard Lacey, Assoc.M.Inst.C.E., on the occasion of his retiring from the position of Hon. Secretary.

It is their desire thus to record their earnest appreciation of the sterling services rendered while occupying this most important office for the last two years.

His efforts have done much to enhance the reputation of the Association; and it is the wish of all that he may continue to find advancement in the industry and enjoy a full measure of good health.

Mr. W. H. Noble.

This testimonial is presented to Mr. W. H. Noble, who for the two sessions from 1923-25 has rendered unobtrusive but useful service to the Association as its first Assistant Hon. Secretary.

In making this presentation, the Council and members of the London and Southern District Junior Gas Association extend to him their sincere thanks, and best wishes for his success in the future.

Mr. W. H. Cosh (South Metropolitan Gas Company) seconded, saying that their voluntary duties were deserving of the highest praise.

Mr. Newton Booth, on behalf of the officers of the Association, thanked the members.

New Officers.

The election of the following office-bearers for the next session was announced:

President.—Mr. W. L. Westbrook, North Middlesex Gas Company.

Senior Vice-President.—Mr. A. Broadbent, Gas Light and Coke Company.

Junior Vice-President.—Mr. Leonard Lacey, Gas Light and Coke Company.

Hon. Treasurer.—Mr. H. G. F. Soar, Gas Light and Coke Company.

Hon. Secretary.—Mr. J. H. Goldsmith, South Suburban Gas Company.

Assistant Hon. Secretary.—Mr. A. Tennant, Croydon Gas Company.

Council for 1925-26.—Messrs. W. T. Kenshole, A. Tennant, H. W. Kerridge, F. S. Larkin, J. K. Grant, E. C. Le Jeune, and J. Hewett.

Small Trenching Machines.—An account has been given to the Illinois Utilities Convention by Mr. A. G. Ford, of the success of his Company—the Western United Gas and Electric Company, of Aurora, Ill.—in obtaining a gas man's trenching machine. That is to say, a machine that will dig mains, services, and pipelines, and do it fast and continuously at low cost. The work of uncovering pipe for reclamation must necessarily be done with a minimum of hand labour; for it is very easy to spend more money uncovering pipe than the pipe is worth. The small trencher makes it possible to uncover at a profit pipe that would otherwise have been left in the ground. Figuring on seven months' work, a table of costs for three machines shows 6·54 c. per foot of digging. This is calculating depreciation and interest on the basis of 28 miles of trench as the life-work of a machine. Mr. Ford, however, is of opinion that 40 miles of trench for the life of a machine would be nearer the fact; and by using this figure as a basis, the total cost per foot would be reduced to about 5·5 c.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Low C.V. Gas and the Unaccounted-for Percentage.

Sir,—I was very interested to read Mr. Keillor's letter in the "Journal" last week. Let me assure Mr. Keillor at the outset, however, that I have not rushed blindly into print without realizing that many would not agree with my remarks. My statements may appear ridiculous to him; probably he has been fortunate in controlling a works and distribution department that has been kept in excellent condition for a long period. It is obvious from my remarks that this was not the case at Newark; and my intention was to make it clear that a low-grade gas cannot be distributed everywhere under present conditions without the possibility of trouble.

Mr. Keillor states that a 500 B.Th.U. gas, if not properly purified, will cause meter troubles. I quite agree with him; but my point is: Given a 400 B.Th.U. gas and a 500 B.Th.U. gas, each with the same amount of impurities, the 400 B.Th.U. gas will cause trouble quicker than the 500 B.Th.U. gas. The protective influence of the oily hydrocarbons in the richer gas will do much towards protecting meters internally. Many of us experienced acute meter troubles during the war, when oil-washing. Mr. Keillor says the secret lies in the purity of one's gas. This is obvious.

I stated that it may be possible to distribute a low-grade gas successfully with dry meters, providing every trace of impurities is removed. I am very glad to hear of this case of successful practical experience. I still think, however, that before a low-grade gas can be distributed successfully all over the country, much preliminary work in the way of improving, purifying, and cleaning-out distribution systems will require to be undertaken in many cases, unless someone comes along with a new type of meter. After all, there has probably been less development in the dry meter than in any other type of gas apparatus.

In the published returns of the Gas Regulation Act, 55 undertakings have increased their declared calorific value, and 7 have reduced it, since obtaining their original Order. The tendency seems to favour the higher calorific value at present. Perhaps the time will arrive when legislation will decide for us (as it is unlikely we shall all agree otherwise) a standard calorific value, when one bone of contention in the gas industry will have been buried.

F. A. West,
Engineer and Manager.

Newark Gas Company,
May 14, 1925.

South Metropolitan Gas Bill.

Sir,—The result of the above Bill before a House of Commons Committee will introduce a new train of thought as to the future policy of the gas industry, particularly as applied to company undertakings.

The stabilization of the basic price for ten years, following on a period of five years, indicates that Parliament appreciates the necessity for protecting a great industry from periodical and frequent revisions, and that Parliament also appreciates that the interests of the public are best served by eliminating from investors a feeling of insecurity—a sure influence against obtaining the cheap capital so beneficial to gas companies and their consumers.

It seems to me that the Gas Regulation Act of 1920 requires some improvement in its formula whereby the capital expenditure is taken into consideration, and the introduction of a provision giving the Board of Trade power to stabilize standard prices over periods of five or ten years. Otherwise a possibility of frequent revision will undoubtedly influence gas companies to "mark time" and become sterile.

R. W. Edwards.

Aldershot Gas, Water, and District Lighting Company,
May 15, 1925.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for May 13.]

Nos. 11,474 to 12,159.

Dempster & Sons, Ltd., R.—"Gas-retort settings." No. 11,987.
Duffield, F. L.—"Production of gas from pulverized fuel." No. 11,946.
Glasgow, A. G.—"Water gas generators." No. 11,829.
Glover & Co., Ltd., G.—"Money-boxes for coin-freed mechanism." No. 11,957.
Heyl, G. E.—"Distillation retorts." No. 11,760.
Humphreys & Glasgow, Ltd.—See Glasgow, A. G. No. 11,829.
Macleod, J.—"Distillation of naphthalene." No. 11,866.
Mitchell, G. P.—"Gas fires." No. 11,722.
Parkinson and W. & B. Cowan, Ltd.—"Safety valves for vapour lamps, &c." No. 12,038.
Selas Akt.-Ges.—"Safety device for glass furnace gas pipes." No. 11,635.
Selas Akt.-Ges.—"Regulating device for gas and air mixing plants, &c." Nos. 11,636, 11,637, 11,638.
Soc. du Verre Sili-Chrome.—"Cleaning gas mains." No. 12,112.
Tilley, F. C.—"Geyser, &c." No. 11,771.
Toogood, H. J.—See Dempster & Sons, Ltd., R. No. 11,987.

REGISTER OF PATENTS.

Purification of Gases.—No. 223,191.

Urbain, E., of Paris.

No. 7239; March 21, 1924. Convention date: Oct. 13, 1923.

In introducing this patent, Dr. Urbain shows, by general observation and detailed examples, the possibility of completely purifying distillation and numerous other gases by utilizing a series of apparatus filled with absorbent carbonaceous material; each apparatus being worked so as to fulfil certain specified conditions. He points out that the variations of temperature in the carbonaceous material may give very useful indications to regulate the working conditions. The claims show the combination of steps which constitute his process; and we reproduce them *in extenso*.

1. The purification of gases obtained by the distillation of fuel and the recovery therefrom of valuable products, by bringing such gases, after they have been freed from tarry matters, into contact with absorbent carbonaceous materials or other solid absorbent substances having similar properties in a series of vessels, so as to remove: First the sulphuretted hydrogen in the state of free sulphur by oxidation; secondly, the ammonia in the state of ammonium sulphite by causing it to react in the presence of carbonaceous material with water vapour and sulphurous acid; thirdly, the condensable hydrocarbons and cyanogen compounds; and lastly, if desired, the carbonic acid; and subsequently extracting the absorbed products by any known method.

2. In the process claimed in Claim 1 the absorption of ammonia as gas instead of its precipitation as ammonium sulphite, as an alternative step in the said process and the subsequent removal of the absorbed compounds from the carbonaceous material.

3. The process of purifying gases obtained by the distillation of fuel and of recovering valuable products therefrom, substantially as described.

4. Distillation gases when purified by the process described as claimed.

Mantles for Upright Burners.—No. 224,850.

Gumperz, A., of Berlin-Schoneberg, and Meyer, A., of Berlin-Charlottenburg.

No. 2281; Jan. 28, 1924. Convention date: Nov. 15, 1923.

This invention is for a self-shaping upright incandescent mantle, the patentees claiming "a non-incinerated self-shaped upright incandescent mantle, for use with upright burners, provided at the base with a ring of metal or ceramic or any other suitable material, by means of which the mantle is placed on the burner head, so preventing the mantle from slipping down the burner head, and having the top-end a loop by which it is hung on the fork of the burner."

Alternately, the mantle is secured direct upon the burner head with wire ribbon, or asbestos thread.

Low-Temperature Distillation.—No. 225,513.

Kohlenscheidungs G.m.b.H., of Berlin.

No. 19,145; Aug. 12, 1924. Convention date: Nov. 28, 1923.

Introducing their invention for a low-temperature process, the patentees say that in the course of laboratory experiments they was established that with careless and sudden heating of the coal the yield of original tar became greater and the quality of the semi-coke better. If, for instance, Essen coal was distilled in the usual manner by gradually heating it to a temperature varying between 500° and 550° C., from 9 to 9·5 p.ct. of tar free from water was obtained. If, however, the apparatus was heated to this temperature prior to being filled with the coal, whereby the latter reached very quickly the low distilling temperature, and if the heating was carefully increased as much as 11·3 p.ct. of tar was obtained from the same material, the additional amount consisting principally of heavy oils. In addition thereto the semi-coke recovered was considerably firmer and much less porous, as was proved in the course of a most careful examination.

Further researches proved, in addition to a greater yield of hydrocarbons and a better semi-coke, that numerous difficulties accompanying the older processes are overcome or lessened—for instance the caking and swelling of the coal, the crumbling away of a large proportion so as to form dust, and so forth.

According to the invention, however, the new process consists in the fact that the material, which is not preheated at all or is only preheated to a slight extent, is suddenly subjected to a temperature which is much above normal distilling temperature—for instance 500° C.—so that the material itself is raised as quickly as possible to the distilling temperature, and that after reaching this temperature it is immediately removed out of reach of the high temperature in order to undergo an after-treatment at the normal distilling temperature.

The main feature consists in the rapid raising of the heat to the distilling temperature by using a degree of heat essentially above 500° C. For this reason, any preheating must not be carried to a degree at which it promotes, by the expulsion of water and the like, the effect of the quick subsequent heating according to the invention. The further treatment of the material at the distilling temperature serves chiefly to expel the last traces of the original tar, &c., and particularly to improve the quality of the semi-coke. With the process, say the patentees, it is of importance that, in order to work within low-temperature limits, the heating of the coal be not carried too far by leaving it too long in the high-temperature zone. The zone in which the coal must remain for a short period only will,

distance, be at about 700° C., and be increased to such a degree only as is absolutely necessary for effecting the rapid heating of the material.

It is pointed out that, in addition to the advantages mentioned, the amount of the material passing through the apparatus is considerably increased, since the speed of working is much greater than before. The patentees suggest that "rapid distillation at low temperatures" properly describes the distinctive feature of the invention.

Experiments have had the further surprising result of showing that the use of higher temperatures than the usual distillation temperature—for instance, 500° C.—is very advantageous not only for the treatment of the sticking coal but also for improving the quality of the distillates. Consequently the yield, especially of light oils, is increased if the hydrocarbons, immediately after their expulsion are passed through a hot zone—for example, through the first zone of the distilling apparatus, which, according to the invention, has been raised to a temperature of 700° C.

Preparation for Repairing Retorts, &c. No. 231,650.

SELLARS, B. C., of Droylsden.

No. 6176; March 11, 1924.

The patentee claims, for the repair of furnaces, retorts, &c., a mixture of dried silicate of soda with alumina, asbestos, fireclay, ganister, or barytes. The powdered mixture may be stored without ill effects, and is prepared for use by the addition of water.

Gas Ovens.—No. 231,664.

LIGGINS, J. W., of Accrington.

No. 7777; March 27, 1924.

In order to prevent the excessive ingress of cold air into an oven, the patentee claims the fitting of a plate, shaped so that a portion lies above the level of the burners and a portion below each burner; gaps being left for the passage of secondary air.

Lighting Control Apparatus.—No. 231,943.

KING, W. E., and THE GAS METER CO., LTD., both of Kingsland Road, E. 2.

No. 869; Jan. 11, 1924.

This invention is for a modification of the firm's well-known automatic lighting mechanism, wherein a train of clockwork, serving to operate the gas tap, is released and locked by means of a trip or stop.

The object of the invention is to simplify its working as applied to variable illumination, such as shop lighting.

The claims are for the inclusion of a mutilated toothed wheel which is partially rotated at intervals automatically so as to bring the teeth thereon into engagement or to bring them out of engagement with teeth on the fly pinion or similar part; and a circular disc, preferably of flexible material, a portion or portions of the periphery of which project so as to engage and temporarily lock the fly pinion in accordance with the desired predetermined sequence.

Valves for Purifiers, &c.—No. 232,012.

DEMPSTER, R., & SONS, LTD., HORSFALL, J. E., and LUMB, H., all of Elland.

No. 6756; March 17, 1924.

The object of this invention is to introduce a simpler valve arrangement than that covered by specification No. 211,269 [see "JOURNAL" for March 26, 1924, p. 791], and one which will reduce the number of valves required for performing the different operations.

The new design will enable the various operations to be performed by movement of a single control member for each valve, one of which is preferably situated at each end of each individual purifier.

Rotary tubular valves are employed in place of disc valves, and are mounted in casings and control ports or passages which lead to upper and lower portions of each purifier. Adjacent casings are placed in communication with one another by an intermediately arranged passage, and the lower end of each valve and casing communicates with a main inlet, or a main outlet pipe. Each valve is closed at its upper end and is keyed or otherwise fixed on a spindle which projects through the top of the valve casing and constitutes the single control member referred to.

Fig. 1 is a vertical section showing two adjacent casings connected by an intermediately arranged passage; and fig. 2 is a section taken on line 2—2 of fig. 1.

FIG. 1.

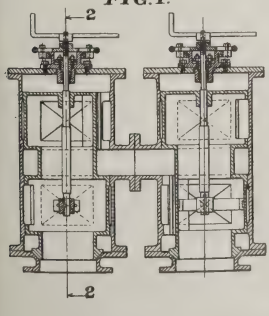
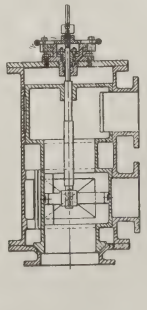


FIG. 2.



Rotary Purifier Valve.—R. Dempster & Sons, Ltd.

Prepayment Mechanism.—No. 232,016.

DOUGALL, J., of Chiswick, W. 4.

No. 6955; March 18, 1924.

This invention is for a safety device applicable to the type of prepayment meter mechanism described in specification No. 214,077 [see "JOURNAL" for May 21, 1924, p. 541].

Inserted between the external operating handle and the coin carrier, it consists of a shutter rigidly attached to the operating handle and co-operating with the coin carrier in such a manner that after insertion of a coin the operating handle has a certain amount of free movement in the driving direction before motion is imparted to the coin carrier, such free movement being sufficient to cause the shutter to obstruct the slot in the price-changing disc before driving contact is established between the operating handle and the coin carrier. The shutter itself forms the driving means for the coin carrier.

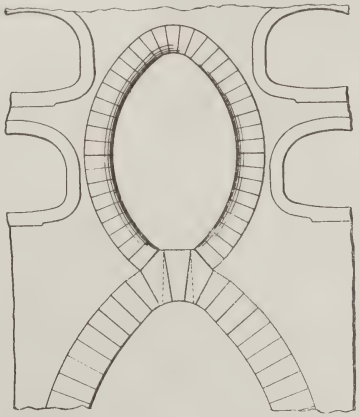
The invention also provides that the driving edge of the shutter and/or the edge of the price-changing disc towards which the coin is driven is or are chamfered in such a manner as to facilitate entrance of the coin into the coin carrier on rotation of the operating handle.

Retort Settings.—No. 232,357.

TOOGOOD, H. J., and DEMPSTER, R., & SONS, LTD., both of Elland.

No. 2510; Jan. 31, 1924.

According to this invention, which relates the regenerator furnaces of retort settings, the abutments on the producer arch for the combustion chamber arches are above or outside the normal contour of the producer arch, and the combustion chamber arches are made in the form of complete ellipses. This construction might seem to be disadvantageous in practice, as it would block the view of the producer gas nostrils from the inspection plugs; but in order to avoid this the keystones of both the producer arch and the superimposed series of combustion arches are combined (the nostrils coming between the combustion chamber arches). This construction gives the combined advantages of added strength of the completed elliptical arches, increased stability of the producer arch, the ability to withstand the indeterminate side-strains due to the increased temperature and use of silica, and withal the full visibility of the nostrils is maintained.



Producer and Combustion Arches.—R. Dempster & Sons, Ltd.

Furthermore, the construction enables the elliptical combustion chamber arches to be designed as complete ellipses of the fullest major and minor axes permitted by the particular grouping of the retorts, and with rounded or bull-nose arch bricks; such ellipses being designed of such shape as to accommodate the active flame of combustion (or inner cone of flame) issuing from the nostrils, with the very minimum of impinging of flame—to the advantage of the life of the refractories and evenness of carbonizing temperatures.

The shape of the keystone brick and the adjacent crown bricks are clearly shown in the drawing which we reproduce. The dotted lines indicate a nostril between adjacent combustion chamber arches.

Prepayment Mechanism.—No. 232,401.

FOX, T., and ROBINSON, S., both of Liverpool.

No. 8393; April 3, 1924.

Patent of Addition to No. 180,406, of Feb. 17, 1921.

This invention relates to the type of prepayment device claimed in specification No. 180,406 [see "JOURNAL" for July 5, 1922, p. 39].

Therein, the handle is adapted to pivot in a plane at right angles to the face of a guard disc acting as coin carrier. It is additionally

provided with a locking member and a guard plate, so that when the coin slot of the price-changing disc and the coin carrier coincide, the spindle is locked against rotation by the locking member or alternatively covered by the external guard.

The object of the present invention is to prevent access through the coin slots in their coincident position to the quantity wheel actuated by the coin. A pivotal slot-covering plate is arranged internally of the guard disc and is adapted to be locked in position by the locking member of the handle to cover the slot, and to be forced out of the covering position by the coin when forced into the coin carrier by rotation of the handle in a plane at right angles to the face of the price-changing disc.

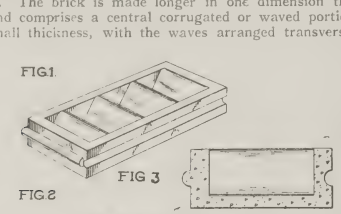
By this construction the coin, when inserted, cannot be pressed fully home by the hand, but must be forced to engage with the quantity wheel by the rotation of the handle.

Muffle Furnaces.—No. 232,480.

Gibbons Bros., Ltd., and Marle, M. V., both of Dudley.

No. 19,863; Aug. 22, 1924.

This invention has for its object the provision of an improved brick or unit for use in constructing the muffle or inner walls of a furnace chamber. The brick is made longer in one dimension than in the other, and comprises a central corrugated or waved portion of relatively small thickness, with the waves arranged transversely of the



Brick for Muffle Construction.—Gibbons Bros.

brick, and a peripheral portion of a width sufficient to contain the corrugations. Tongues or grooves for engagement with adjacent bricks are provided on all four of the outer edges of the peripheral portion, and these tongues and grooves are of shallow dimensions in comparison with the width of the other edges. Preferably, the thickness or depth of the peripheral portion is less than its width—*i.e.*, less than the over-all thickness of the brick.

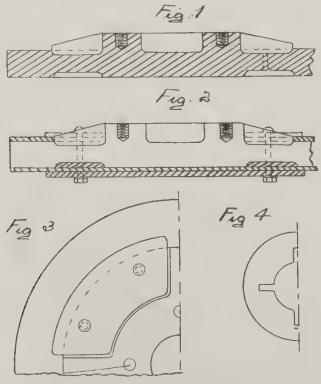
Fig. 1 is a perspective view of a brick, fig. 2 is a sectional view, and fig. 3 a transverse section.

Gas-Tight Disc Valves —No. 232,514.

Dempster, R. & J., Ltd., of Manchester, and Hill, W., of Stalybridge.

No. 27,637; Nov. 19, 1924.

The object of this invention, for purifiers, &c., is to enable leather facings to be suitable for making disc valves gas-tight; and in carrying out the invention, the patentees make use of prepared leather, having found that leather sufficiently impregnated with ordinary codliver oil is admirable for the purpose. In practice, they find that soaking the leather in the oil for about three days, when the oil is at ordinary atmospheric temperature, is sufficient.



Leather-Faced Disc Valve.—R. & J. Dempster, Ltd.

The application of the principle is clearly seen in the drawings we reproduce. Fig. 1 shows the metal disc without facings, while in fig. 2 are seen an upper and lower leather held in position by metal clamps and bolts. The upper clamps are four in number and segmented in shape, so as to clear the webs necessary for strengthening the disc; and the upper leather must be shaped for the same reason. They are shown in figs. 3 and 4 respectively.

PARLIAMENTARY INTELLIGENCE

HOUSE OF LORDS.

Forfar Gas Order Confirmation Bill.

A Bill to confirm a Provisional Order relating to Forfar gas wa presented last week by Lord Balfour of Burleigh, read the first, second and third time, and sent to the Commons.

HOUSE OF COMMONS.

Progress of Bills.

Bill reported, with amendments: South Metropolitan Gas.

The petition deposited by the Brighton and Hove General Gas Com pany against the New Shoreham Harbour Bill has been withdrawn.

The Forfar Gas Order Confirmation Bill was brought from th House of Lords, read the first time, and passed for third reading.

The Kilmarnock Gas and Water Provisional Order Bill has bee read a second time, and committed.

Statutory Gas Companies (Electricity Supply Powers) Bill.

This Bill, promoted by Mr. Clarry, was considered on the 14th inst read the third time, and passed.

Scientific Research.

Replying to Mr. H. Williams last Friday, Mr. Guinness stated tha a sum of £4,045,500 had been provided in the 1925-26 estimates fo scientific research of all kinds.

Gas Regulation Act.

A copy was presented of a draft of a Special Order proposed to b made by the Board of Trade under section 10 of the Act, on th application of the Haverfordwest Corporation.

The draft Special Orders for the Altrincham Gas Company and th Stockton-on-Tees Corporation have been approved, on the motion o Sir Burton Chadwick.

MIDDLESEX COUNTY COUNCIL BILL.

Petition by the Brentford Gas Company.

This Bill was under consideration last week by a Committee of the House of Commons, presided over by Colonel Wheeler. Its object is to confer further powers upon the Middlesex County Council and the Metropolitan Electric Tramways, Ltd., in reference to their light railways and tramways, and to enable the Council to make street improvements and tramways. The Brentford Gas Company, whose area of supply includes a large part of the county, petitioned against the Bill because, under the powers sought, lands and property of the Company might be compulsorily acquired, and their mains, pipes and apparatus might be altered and interfered with. Therefore, if the powers in the Bill were granted, it was asked that provision should be made for fully protecting the Company's property, rights and interests.

Though the Company were represented by Counsel (Mr. Ralph Bury), and Mr. A. A. Johnston (General Manager) and other officials were present in the room, the matter was not dealt with by the Committee. Negotiations are proceeding between the Council and the Company; and it is hoped that an agreement will be arrived at before the Bill reaches the House of Lords.

SOUTH METROPOLITAN GAS BILL.

Thursday, May 7

(*Concluded from p.* 475.)

At the conclusion of Dr. Carpenter's evidence, he was asked by a member of the Committee what his opinion was with regard to a long-dated provision for revision. His reply was that a period of 10 or 15 years would give him reasonable time in which to develop his undertaking—a certain security of tenure. It was pointed out by Mr. M'Millan, however, that an opportunity for revision would be presented when the Company next came to Parliament, and certainly 10 or 15 years would not elapse before they did this.

Mr. *Frank Jones* (Vice-President of the South Metropolitan Gas Company, Chairman of the Wandsworth, Wimbledon, and Epsom District Gas Company, and a Director of other gas companies) gave evidence. He pointed out that, under the Gas Regulation Act. the standard price was fixed by adding to the pre-war standard price (which was fixed by Parliament) an amount which would cover the increased costs of production, beyond the control of the Company, since 1914. If the Gas Regulation Act principle were applied to the South Metropolitan Company, however, which had its standard price abolished in 1920, that principle would be applied not to the pre-war price, but to a price fixed in 1920; and the latter figure did not cover the costs of the Company. This was proved by the fact that, subsequently, the price of gas had been increased beyond the basic price. It would be a very serious thing if at any time any persons could go to the Board of Trade and say that they thought a certain principle ought to be applied, and ask the Board to apply it. Discussing the question of the effect of the reduction of the Company's present basic price upon the workers, he pointed out that a great deal of industrial trouble had been caused by the fact that, when the workers had increased their output, their remuneration had been reduced. He said that the Parliamentary system of watching over the conduct of gas undertakings had worked quite well; and he challenged Counsel for the London County Council to put his finger on a single instance where the system advocated for the future had failed in the past.

In cross-examination, some discussion arose as to the working of he Gas Regulation Act. Mr. Abady's point was that, when arriving t a standard price under the Act, the starting point was the pre-ar standard price, which was fixed by Parliament, and the Board of rade fixed a new standard price which would leave the gas under-akers in the same position as before the war. A gas company could o to the Board of Trade at any time to have its standard price in-reased, if necessary; and he put it to witness that the Act afforded erfect elasticity, so as to prevent a company being prejudiced by lterations in economic conditions. Mr. Jones said it fell short of hat; and he pointed to the effect which regulations for revision at ny time had upon the investor, who never knew what his dividend ould be.

Mr. ABADY said that what the Company were asking for was hat the basic price should be fixed so high that it accommodated ny change in costs which might occur.

Witness said that he wanted the price fixed by Parliament.

As to the attitude of the gas industry at the time the Gas Regu-ation Act was being framed, it was suggested by Mr. Abady that the ndustry went to the Board of Trade, and asked that a Bill should e promoted, giving the Board power to revise charges, in contra-istinction to the previous practice of coming to Parliament. Also, e suggested that the National Gas Council had passed a resolution pproving the Bill. The reply of Mr. Jones was that the industry ad asked the Board of Trade to put them in a position to pay their ividends, and to get them out of the then existing impossible position. n 1919 gas companies had the right to appeal to Parliament; but at present, when local authorities asked for a revision of price by the Board of Trade, the companies could not appeal to Parliament.

Sir *Herbert Hamblin* (President of the Institute of Bankers, and Deputy Chairman of Barclay's Bank) said that in May, 1920, the p.ct. stock of the South Metropolitan Company had stood at £55 or £100, but before the war the value was £112. At present the Company's basic stock stood at £95. It was important that stocks of this character should be stable, because the investor in this class of stock was, as a rule, of a conservative type. As to the reason for he high value of the stock before the war, he said it was the fact hat the Company had enjoyed good credit, and was efficiently managed, which had probably induced many investors to take up the stock. The standard price had not been interfered with for many years; and on that basis the stock had attained a very desirable position on the market. If the basic price were to be overhauled at requent intervals, in accordance with changes in economic conditions, he stock would certainly be affected. The carrying of a fairly wide margin between the selling price and basic price gave a feeling of confidence to investors, and induced them to buy stock on a 5 p.ct. basis, with a faint hope that they might get more. Undoubtedly, those who advised investors looked at the basic price; and the continuance of the basic price was an element in the stability of the investment. Therefore, it should not be interfered with lightly, and should only be overhauled when there was an extreme divergence which rendered it an unfair price. Cheap capital enabled cheap gas to be supplied.

Mr. ABADY, cross-examining, pointed out that when the stock of the Company had stood at £55, in 1920, the dividend was restricted to 3 p.ct., because the Company were working under the Temporary Increase of Charges Act. The present figure of £95, however, was on the basis of a 5 p.ct. dividend.

COUNSEL asked the witness whether, if the basic price were reduced to a point at which the Company would be able to pay the dividend paid last year, and still leave a reasonable margin, the price of the stock would be affected materially.

Witness replied that it would not be affected materially, but the alteration would have an effect, because this was one of the factors considered when recommending a particular stock.

Mr. M'MILLAN, re-examining, said they were not concerned at the moment with the effect of one alteration of the basic price, but the effect of frequent alterations.

Witness agreed.

Following a request by the Chairman, the promoters promised to give information with regard to neighbouring gas companies with stock corresponding as nearly as possible to the stock of the South Metropolitan Company, in order that the Committee might see how the investing public regarded the stock of this Company as compared with that of other companies.

Mr. *F. I. Pitman* (Messrs. Rowe & Pitman, Stockbrokers) also gave evidence with regard to the stock of the Company, and emphasized the necessity for an adequate margin between the selling price and basic price. If, after the South Metropolitan Company's scheme had been working for five years, a clause were imposed upon them providing for the revision of the basic price at any time, it would produce a very bad impression in the mind of the investor, because it would appear to him that Parliament, for some reason, had thought fit to pull the Company up.

Mr. *William Cash*, F.C.A. (of Messrs. Cash, Stone, & Co., Chartered Accountants, and Chairman of a number of gas companies, Vice-President of the National Gas Council, &c.) said that the undoubted tendency of revision under the Gas Regulation Act provisions was to sterilize the position of gas companies. They were deprived of any advantage which would have arisen out of economies or growth of business if there had been no war. He was not complaining of the way in which the Board of Trade had carried out their duties, because he personally believed they were fair and reasonable; but the difficulty lay in the application of the formula in the Act. It was not an advantage to a company to have its price liable to revision continually. Such facts as this had to be stated in a prospectus; and the investor, who did not understand these things precisely, was left in doubt as to what sort of dividend he might get. Dealing with the present rise in costs, he said he doubted whether the increase of ¾d. per therm which had been made by the Company recently in the selling price of gas was really sufficient; but the Company were notorious for endeavouring to sell gas at the lowest possible price, which policy was the right one.

Mr. Cash then handed-in a statement showing the results of revisions of charges of gas companies under the Gas Regulation Act. These companies were the Gas Light and Coke Company, and the Commercial, Eastbourne, Newcastle, Walker and Wallsend, Brighton, Wandsworth, Portsea Island, Brentford, and Tottenham Companies. All these had had the standard prices, granted originally under the Act, reduced recently; and the table showed that in no case was the present standard price below 11d.

The following table was then handed-in to show what would be the present standard price of the South Metropolitan Company if the Gas Regulation Act had been applied:

Comparison of 1913 *costs with those for* 1924 *as per the printed accounts for those years, with adjustments for changes since December,* 1924 *showing increase of* 1913 *standard price by reference to increased costs.*

	1913.			1924.	
		£			£
1. Working expenditure		1,970,060	..		4,111,845
Less—					
2. Rent of stoves, meters, &c.	£254,296		..	£406,736	
3. Residuals	667,553		..	1,244,986	
4. Sundry receipts	2,970		..	4,712	
5. Co-partnership bonus	52,348		..	66,074	
		977,167	..		1,722,508
6.		992,893	..		2,389,337
7. *Add* net interest		67,718	..		119,667
8.		£1,060,611	..		£2,509,004
		d.			d.
9. Cost per therm		3·402			6·933
				d.	
10. Increased cost to Dec. 31, 1924				3·531	
11. Increase in wages from Jan. 1, 1925 (£40,000)				·110	
12. Increase in net cost of coal since Jan. 1, 1925				·287	
13. Savings in costs due to improved working results				·338	
14. Cost of extra 1 p.ct. standard dividend granted by Parliament in 1920				·182	
15. Total increased costs				4·448	
16. Pre-war standard price of 3s. 1d. per 1000 c.ft. = per therm				7·400	
				11·848d.	

Mr. ABADY, examining Mr. Cash's table, pointed out that the pre-war standard dividend of the Company was 4 p.ct., and not 5 p.ct., and that if the pre-war standard price were expressed in terms of a 5 p.ct. dividend it would have been equivalent to 5·9d. per therm, instead of 7·4d. If the basic price which entitled the shareholders to the same dividend to-day was 11d. per therm, the increase above the pre-war standard would amount to 5·1d. per therm. This was an increase of nearly 100 p.ct.

Mr. *Cash* did not agree with this way of putting it. If Counsel wanted to say that the standard price in 1914 was 5·9d., and not 7·4d., then there would have to be added the increased cost between 1914 and 1919, which was about 5d., giving a figure of 10·9d., which was very near 11d.

Mr. *H. T. Manley* (an Employee-Director of the South Metropolitan Company), in evidence, said that the workers fully understood the principles of co-partnership, and were fully alive to the fact that under the present system the consumer obtained a better distribution of profits than under the sliding-scale. The scheme had had a very good effect upon the attitude of the men towards the Company. There were 7775 co-partnership owners of stock, holding capital to the extent of £540,000; and since 1920 there had been strenuous and continuous efforts on the part of the men to keep-down the price of gas by means of hard work, as well as by skilful and intelligent work. The workers appreciated the fact that they had a statutory right to their benefit under the present scheme. The effect of reducing the basic price would be disastrous for all parties concerned. It would remove the workers' sense of security. They were keen on investing their savings in the Company; and if there was a possibility of the basic price being reduced, they would ask themselves seriously whether they would not do better to invest their savings elsewhere.

The Committee adjourned until Friday.

Friday, May 8.

Sir *William Plender* (Messrs. Deloitte, Plender, Griffiths, & Co., Chartered Accountants) said that he had advised the Company with regard to the provisions of the Act of 1920. The basic price of 11d. did not represent the exact equivalent, on the thermal basis, of the pre-existing standard price, but was separately arrived at. Dealing with the importance of an adequate margin between the selling price and the basic price, he said that costs of production were at present on the up grade, and wages were rising. An increase in rates of wages was granted as from Jan. 1, 1925, which was estimated to cost the Company £40,000 per annum, or 0·11d. per therm. Further, the net cost of coal was increasing, in spite of a reduction in the gross cost. This increase for 1925 was estimated at 0·287d. per therm, so that, together with the increased cost of wages, the increase would be 0·397d. per therm. In 1924 the amount by which the cost of gas to the consumer was less than 11d. per therm was £1,136,633, equivalent to 3·140d. per therm, so that the increased costs would reduce the latter figure to 2·743d. per therm. Further claims for increased wages in the gas industry, however, had been submitted. From an announcement in "The Times" for April 30, the men's claims were for an increased wage of 2s. per day, payment at time-and-a-quarter for night duty, and two weeks' annual holiday with pay. The effect of the increase of 2s. a day was equivalent to about two-thirds of a

penny per therm. Whether the increase would be granted or not, he did not know; but he mentioned it as a possible contingency which would reflect itself in the increased cost of gas. In view of the varying conditions since 1920, he did not think there had been at any time an excessive margin between the basic price and the selling price. In considering what was an adequate margin to allow, they had to take long views. The purpose of the fixation of the basic price was to enable the Company to proceed with a measure of assurance in making their arrangements for business, and as affecting their financial position in the market. Allowance had to be made for the fact that at present there was not the same stability as before the war. In the present period the margin should certainly not be less than before the war. Between 1920 and 1921 the net cost of coal had risen by the equivalent of 2d. per therm; and in 1922 the net cost of coal was 1d. per therm over 1920. In further justification of the maintenance of the basic price of 11d., he referred to a period of 30 years prior to the war, with a view to ascertaining what the margin was between the standard price and the price charged by the Company for gas supplied. He had found that, with perhaps one exception (1901), the margin between the two prices was in each year proportionately greater than the margin now existing. At present the selling price was 2¼d. per therm, or 20·5 p.ct., below the basic price. In 1914 the amount charged was 28·4 p.ct. below the standard price; and in each of the years 1910 to 1913 it was 29·7 p.ct. below the standard.

A table was submitted which demonstrated that, since the Act of 1920 became operative, the prices charged to the consumers had, with the exception of two abnormal half-years, been below the basic price. During 1923 and 1924 they were appreciably less. The consumers had received benefits far in excess of their share, as measured by the amounts distributed to the co-partners and stockholders; the dividends paid had been moderate; and the percentage of increase since the war was very much below that of Government or Trustee stocks. The percentage margin between the prices charged and the basic price had been no higher since 1920 than for many years before the war, when no alteration in the then standard price was suggested or attempted. The margin now prevailing was only fair and reasonable, in order to preserve a balance for emergencies, which even recent experience had proved to be a necessity.

Mr. Abady, cross-examining, said that, if 1924 were compared with a previous year under this scheme, and there had been an increase in the sale of gas owing to the number of consumers having increased, and the selling price had been maintained at the same level, while the benefit to the individual consumer would be the same, the benefit to the shareholders would be increased, because the amount saved to the consumers would be expressed in terms of a larger number of therms sold. Therefore, the shareholder would have his share increased without the price to the consumer being reduced. Under the sliding-scale, a reduction of 1d. in the price of gas would entitle the shareholder to one increment of dividend; and the amount that a shareholder could take would be limited by the amount of his shares. The inference he wanted to draw was that, with a basic price, there was less incentive to reduce the selling price of gas than there would be under the sliding-scale, because, by a mere increase in sales, the shareholder could divide a larger amount.

Sir *William Plender* said that, whatever the margin might be, the Directors would always reduce the price to the lowest possible figure. Their main interest was the consumer; and, so far as he knew, this had never been questioned during the last five years.

Mr. Abady replied that he did not think it would be questioned in respect of any gas company. Continuing, Counsel pointed out that the Company had a reserve fund and a special purposes fund; the latter being designed to meet expenses incurred by reason of circumstances which due care and management could not have prevented. Therefore, if it were said that the margin between the selling price and basic price was necessary in order to meet contingencies, it must be remembered at the same time that there were other resources.

Witness observed that the question of drawing on the funds depended entirely on the present conditions; it was a question of what was the best financial policy. He admitted that at present the margin was considerably more than that in 1920, when the question of contingencies was considered.

Re-examined with regard to the point that the shareholders benefited by a mere increase in sales, witness said that a low selling price stimulated sales, and the increased sales might, therefore, be the result of the Company's policy of selling at the lowest possible price.

This closed the case for the Gas Company.

Mr. Abady, addressing the Committee on behalf of the London County Council, said it had been stated by the Company that they had come to Parliament in 1920, and had made a special case before a Parliamentary Committee, and had urged this case on their distinguished record—a record which was to be regarded as different from the records of other companies. This, generally, was the note which had been sustained throughout the present proceedings; and it was suggested that this record justified a special treatment being accorded to the Company. If the clause which the London County Council asked for were not inserted in the Bill, the South Metropolitan Gas Company would be the only one in the Kingdom, selling gas by the therm, which would not be subject to revision in the manner provided by the general law. This was a strong position to take. The County Council had no complaint to make as to the manner in which the South Metropolitan Gas Company had dealt with the public in the past, or had approached the County Council with regard to matters concerning them. There was no rancour. The Council were merely pursuing their public duty. When the Company came to Parliament in 1920 they were suffering from something from which all sliding-scale companies were suffering. It had been said that the general Act did not apply with absolute uniformity to all gas undertakings in the provinces and in London. He maintained that it did; and it applied to the South Metropolitan Company itself with respect to the quality of the gas supplied. Therefore, it applied absolute uniformity to every undertaking in the United Kingdom which was selling gas by the therm, including the South Metropolitan Company, except, in the latter case, in regard to the one matter of the method of fixing the price. Dealing with the present position under the Gas Regulation Act of 1920 as regards revision of price, Counsel said it was idle to suggest that to-day there was nobody at the Board of Trade capable of dealing with the revision of prices. The Board of Trade had already, under the Gas Regulation Act, revised the prices of hundreds of companies, some of them in the downward direction. The procedure was that schedules of costs were prepared, as before the Act, and at the time of revision, and the necessary adjustments were made. On this ground, therefore, there was no reason why the South Metropolitan Gas Company should not come within the same procedure. Moreover, it was not accurate to say, as had been claimed on behalf of the Company, that its Act of 1920 introduced for the first time a system of charging for gas on a heat basis. As a matter of fact, at the time the Company's Act was passed, there were about a hundred companies which had received Parliamentary sanction to supply on the basis of calorific value; and the bulk of the gas in the London district was supplied on a heating basis at that time. It was true that up to 1920 the obligation still remained upon the gas companies to charge by the thousand cubic feet, but each cubic foot had to contain a prescribed number of thermal units. He contended, therefore, that the South Metropolitan Gas Company could not claim to be pioneers as regards selling gas on a heat basis. Dealing with the Company's Act of 1920, Counsel agreed that there was a material alteration of the Company's position under that Act, to which attention should be drawn. As things stood before the Act, the shareholders were never sure of the 4 p.ct. on the shares; but under the Act the Company were given a minimum of 5 p.ct., no matter how high the charge was, in order to pay this dividend. It was here where the public interest came in, and why the London County Council were so concerned. It was stated that there was only a difference of 2½d. between the basic price and the selling price; but it must be remembered that 1d. per therm represented 5d. per 1000 c.ft., so that there was a margin at present between the basic price and the selling price of 1s. 0½d. per 1000 c.ft. The view of the London County Council was that, unless the basic price and the selling price or costs were in close consonance, there might just as well be no basic price at all, so far as it provided an inducement to the Company to reduce the price of gas. Nobody would suggest that the Directors of the Company were not perfectly honest straightforward business men, who at all times were actuated by a desire to do the best for the consumer; but the point was that Parliament, in the Gas Regulation Act of 1920, had laid down a procedure for the revision of prices of all gas undertakings in the country. Why should not the South Metropolitan Gas Company come within this general Act? The present Committee had no evidence upon which they could fix a new price. All the Committee had got was that Dr. Carpenter had agreed that costs to-day were lower than they were in 1920; and Mr. Cash had said the same thing. Thus the Committee were unable to say that the present figure of 11d. was or was not sufficient. The London County Council were fighting for a principle—viz., revision by the Board of Trade. If the Council's clause was not inserted, he would ask that a clause be inserted which would bring the Company to Parliament at intervals, so that revisions could be made at the instance of either the Company or the Council. A period of ten years had been suggested by one of the members of the Committee. It was not in the public interest that this Company should be left absolutely without any provision for revision of its price; and the same would be said of any company, however good or capable its management.

At the conclusion of Mr. Abady's address, the Chairman gave the decision of the Committee which was recorded in last week's "Journal"—namely, that the basic rate of 11d. was justified at the present time, but that an opportunity should be given for revision, if the circumstances warranted it, in 1935.

Wednesday, May 13.

Sir Lynden Macassey, K.C., for the promoters, submitted the following clause, which, he said, gave effect to the Committee's decision as regards the basic price and revision. [The preamble of the Bill generally was found proved at the previous sitting of the Committee.]

(1) The Company shall, not later than in the session 1935, promote a Bill in Parliament giving an opportunity for the amount of the basic price prescribed by the South Metropolitan Gas Act of 1920 to be revised by such Bill.

(2) The London County Council and the Council of any Metropolitan Borough or Urban District within or partly within the limits of supply of the Company shall (subject to their complying with any relevant statutory requirements and Standing Orders of Parliament) be entitled to be heard before the Committee, to which any Bill promoted for the purpose aforesaid shall be referred, as to whether a new basic price should be substituted by such Bill for the basic price prescribed by the said Act of 1920.

Sir Lynden Macassey said that, by the terms of the clause, there would be no question as to the *locus* of the local authorities being challenged. They would be heard as to whether a new basic price should be substituted for the existing price of 11d. The clause had been submitted to the London County Council; but they had made no comments upon it, so he could only assume that they were keeping the way open for opposition in the next House, on principle.

The Chairman said the Committee would accept the clause, although they would like Sir Ernest Moon, K.C., the Speaker's Counsel, to examine it. If he proposed to make any modification, it would be communicated to the parties.

The Parliamentary Committee of the London County Council, in a report presented for confirmation at the meeting of the Council yesterday, stated that the clause which has been inserted in the Company's Bill does not meet with the objections of the Council; and they have therefore given instructions for a petition against the Bill to be deposited in the House of Lords.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Ordinary General Meeting of the Association was held last Wednesday, at the Cannon Street Hotel, E.C.—Sir Charles J. Jessel, Bart., in the chair.

The Secretary (Mr. F. H. James) read the notice convening the meeting.

The Register of Proprietors.

The Chairman: I now beg to move that the Common Seal be affixed to the Register of Proprietors.

The seal having been affixed,

The Chairman proceeded: I beg to move:

That the interim dividend at the rate of 5 p.ct., less tax, paid in respect of the half-year ended June 30, 1924, be hereby confirmed.

The Deputy-Chairman (Col. H. LeRoy-Lewis, C.B., C.M.G., D.S.O.) seconded the motion, which was unanimously agreed to.

The Chairman then called upon the Secretary to read the Auditors' certificate on the accounts submitted; and this having been done,

The Chairman proposed:

That the accounts for the year 1924 and the scheme prepared in accordance with the Companies' Clauses Consolidation Act, 1845, showing the profit available for the purposes of dividend, which the proprietors have before them in the form of the Profit and Loss Appropriation Acount, be taken as read.

Loss by Death.

The Chairman: Ladies and gentlemen, I regret to have to begin my remarks to you this afternoon by referring to the gap that occurred in our Directorial ranks through the sudden death on June 26 last, of Mr. Hugh Goodwin Newton. Mr. Newton's family had long been connected with the Association. His father had been an Auditor from the early Sixties, was elected a Director in 1867, and was made Chairman of the Association during my first year of office in 1895. He served as Chairman until 1903, and died in 1906. He was succeeded by Mr. Hugh Newton, who therefore served the Association for no less than eighteen years. He was a useful Director, and we greatly deplore his very sudden death. In his place we have, as you see, elected Mr. George Jessel. I hope you will pardon the partiality of a parent if I say that we could not have done better. No doubt some of you will have read the interesting document referring to our centenary which was sent out to you with the accounts, and will have noticed that in the early years of the Association my son's great-great-grandfather was a Director, at the same time as his son Sir Francis Goldsmid). So history, after a certain number of years, has repeated itself.

The Accounts.

Now I think I cannot do better than I have done in previous years —that is, take you through the accounts that are in your hands. On the right hand side of the profit and loss account, the first item is "net profit from stations, £174,943 10s. 9d." I should like to dwell on that item for a few minutes, because I have received two letters from proprietors who are somewhat anxious as to the future. They notice the item of "Revenue proportion of German compromise. £179,783 14s. 3d.;" and they have deducted this from the balance of profit on the left-hand side. The two gentlemen to whom I refer then proceed to ask: "How on earth are you going to continue in the future to pay 10 p.ct. dividend, if you only show about £50,000 profit"? I should like to draw your attention to the fact that on the debit side you will see "Income-tax and corporation profits tax. £119,103 13s. 4d." Of course that includes the income-tax on the revenue proportion of the German compromise, as well as the corporation tax, which will not appear in the accounts again. The combined amount is about £50,000. Then again, you will see an item "Exchange and contingency account, £14,000," which is by way of reserve. It is also to be remembered that the practice of this Association has always been, when we have had money to spare, to write down everything to what I may call absolutely ground-level. That is to say that, if there is any doubt in our minds, we write it down to the very smallest sum we can think of. The reason we do that is that we have to amortize all our assets abroad. It saves the amortization fund in years which may not be so prosperous. I do not for one moment wish to suggest that there is any magic about the 10 p.ct. dividend. No promises have ever been made by me, or by anybody else, that we are going to pay 10 p.ct. for the rest of our life as the Imperial Continental Gas Association; but what I think runs in the minds of these shareholders is that this Association has always been of a conservative character, and therefore we are not likely to pay a dividend of 10 p.ct. unless it is fairly assured for the future. Well, I can tell you that, as far as I can see, in spite of the many difficulties—particularly difficulties connected with exchange—which are obtaining abroad, I do not contemplate any trouble in maintaining this rate, at all events for the current year.

Dividends on Investments.

"Dividends on investments, interest, discounts, &c., £125,168 11s. 3d.," you will see are lower than last year by £13,215. The reason for this is that 1923 included a little extra dividend that were received from the now-absorbed Lille Electricity Company. From this source we received in 1923 £6000 odd, which was for dividend during the war period. Then again, you must remember that we exchanged considerable amounts of Conversion Loan against debenture stock; and you will see the benefit of this on the other side, where, of course, the debenture stock interest is correspondingly decreased. I do not think I need dwell further upon that.

The German Compromise.

The next thing I have to talk to you about is the revenue proportion of the German compromise. You will remember that we received on previous occasions, of the £1,600,000 which we were to get, all except £387,487 10s., which sum we received on May 1 of this year. Deducting the Clearing Office commission of £39,000, we have to account for £1,561,000; and the apportionment of this net sum is as follows:

Capital accretion	£1,081,561	
Revenue	479,439	

Now before I go further into this, I think it will be as well to refer to another letter which I received from a shareholder. When in July last year we received a sum of money through the Clearing Office, this shareholder wrote to the office of the Association and asked why the money was not at once distributed. Well, the answer to this is that, under section 120 of the Companies' Clauses Consolidation Act we are not allowed to divide anything unless we submit to our shareholders a scheme of profits. Ten years ago, when I was a hot-headed youth of about 55, and when I was not even restrained by a Secretary who was then an impetuous young man of very nearly 60 years [Laughter], I proposed to you on two occasions to pass a dividend of 4½ p.ct.—that was during the war, and the money was very gratefully received by the shareholders. I then one day was approached by a shareholder, who almost threatened to prosecute me for having committed a crime against the Act of Parliament to which I have referred. Thereupon I had recourse to our legal adviser, who told me he was perfectly sure that I had committed a crime; and with a prospect of long lingering in gaol, I consulted him as to how I should get out of the difficulty. He said that the only way was to obtain an Act of Parliament condoning the offence. Well, we did get an Act of Parliament condoning this offence; but, of course, I was not going to expose my crime, and so we wrapped it up with other things which we thought necessary—such as having only one meeting in the year, &c. I think we are to be congratulated —myself, and the Secretary, and Messrs. Dyson (our Parliamentary Agents) on securing an Act of Parliament which has very much facilitated the distribution of the various sums which we received. To go on with my story, of the revenue proportion, £359,582 17s 10d. has been taken into general revenue up to Dec. 31, 1924, and utilized mainly for the general purposes of the business—*e.g.*, financing the considerable capital outlay at the stations. Towards the end of 1924, the sum of £142,922 was remitted out of these funds to cover part of the call on the Association's subscription to the new issue of shares of the Cie. Continentale du Gaz, Paris—a Company which offers good prospects of a profitable employment of the funds invested. This Company paid a dividend at the rate of 10 p.ct. in 1924, and shows every sign of maintaining that rate this year. The centenary bonus dividend, which, if approved by you to-day, will be paid on May 26, is made possible by the German compromise revenue. The balance on revenue account of £119,856 2s. 2d. will appear in the accounts of the present year, as the accounts for 1924 had been closed some time before it was definitely known if, and when, the final payment would be received. It must be borne in mind that the final revenue proportions will suffer deduction of income-tax at the rate in force at present. The capital accretion has been dealt with as follows:

Special dividend June 15, 1923, 12 p.ct. . .	£237,113	7	8
,, ,, May 20, 1924, 10 p.ct. . .	£197,600	0	0
Proposed ,, ,, May 26, 1925, 19½ p.ct. . .	£385,320	0	0
41½ p.ct. . .	£820,033	7	8

Well, now, you would like to know, perhaps, what we intend to do with the balance. Some time ago—I will not say that I wrote an article—I inspired a paragraph that appeared in "The Times" with reference to what was going to be done; and I then was bold enough to say you were going to get 50 p.ct. as capital accretion; so this leaves another 8½ p.ct., or £107,960, to come next year—making a total of £987,993 7s. 8d. dealt with in this way, and leaving a balance to be carried forward for capital purposes of the business generally (and we urgently require it in the business) of £93,567 12s. 4d.

A Claim for Interest.

Then I have something else to tell you of a pleasant nature. You will recollect that, at the last meeting, I informed you of the rejection by the Mixed Arbitral Tribunal of our claim for interest upon the German compromise owing to the lengthy delay in settlement. This year I am able to give you more satisfactory news. The British Clearing Office, who had urged this course upon us, and who have always been zealous in guarding the interests of the British claimants, felt that the principle at stake was too great to permit this rejection to be accepted without an attempt on their part to obtain what they considered, and what I consider, was only justice. They therefore entered into negotiations with the German authorities, and on Sept. 13 1924, an agreement in respect of the payment of interest was concluded. The Association is therefore the lucky recipient of a net sum of £62,332 19s. 6d. (after deduction of income-tax and commission) in respect of the claim rejected by the Mixed Arbitral Tribunal. [Applause.] Of course, any question about the disposal of this or any like sum will have to be left over to another year, therefore I do not think I need worry you any more on this subject now.

Profit and Loss Account.

Now I will return to the profit and loss account. You will see on the left-hand side Expenses in London, &c., show a reduction of more than £2000; and then comes the item of income-tax and corporation profits tax, which I have already referred to. Interest on debenture stock is, of course, down by £3156, and balances with the smaller amount of interest received on Conversion Loan stock on the other side. The general amortization account is up by £15,439. I shall just have to say a word about that, because one of the shareholders (he happens to be an eminent K.C.) wrote to me on the subject, and said: "I do not see why you should have any amortization fund at

all. Your capital is represented on the other side by investments; why make an amortization fund?" Now, having been responsible for a great many years for the financial policy pursued by the Board, I am rather touchy on the question of that policy; and I should like to explain once and for all that the policy of the Association for long past has remained the same—namely, that any asset which is in our hands should be kept going at a constant value. The moment it ceases to have that value, it should be written-down. Therefore if we have, as you know we have, leaseholds abroad, we must be prepared to replace these leaseholds in one way or another. This has been the fixed policy for a number of years; and I hope you will never think it necessary to question for a moment whether the capital is intact, or expect us to take into consideration what premium or discount our stock stands at. The amount appearing for legal charges is accounted for by a French case which arose when we had French stations of our own. This case goes back as far as 1906. They are even slower there than in England on the subject of taxation; for they have taken eighteen years in France to settle this question. We had at all events the interest on the money for this long period; and then when we had to pay it away, it was in francs, which were at that time 82 to the pound. Though the amount looked large in francs, when reduced to sterling it was not a matter of great consideration. The balance of profit for the year is £230,628.

The Balance-Sheet.

With reference to the assets side of the balance-sheet, the item of "Works, mains, &c.," is £174,049 up, principally on account of the Brussels electricity extensions. Freehold land forming the sites of works is very different—£99,000, against £152,000. What has happened is that we had made a reserve for depreciation on account of this freehold land, but it appeared on the other side under sundry creditors; and we have thought it better to show what the real position is. Freehold land abroad has, in the currency of the respective countries, increased in value naturally, but it has not increased in value as much as the currency has gone down in terms of sterling. Therefore when we are presenting to you accounts which are rendered in sterling, we thought it better to have this item clearly set forth. There is an increase of £71,000 in stocks at stations. This applies really to all categories; but I am sorry to say there is one disquieting feature—and that is the large stock of coke at Antwerp, which we cannot dispose of. When I last heard of it, it was 22,000 tons; but I am glad to say it is not growing. This is a matter which, I think, affects nearly every gas company all over the world. There is an increase of cash; we happen to want a good deal more money abroad at the moment. The large reduction under sundry debtors is owing to the inclusion last year of £188,000 on account of the German compromise, which we had already received months before the meeting. You cannot, therefore, really compare the item with this year. We also received a sum of money from the Cie. Continentale du Gaz. I need not dwell at this point on the item "German Compromise." Loans to foreign gas and electricity companies are smaller, because the Central Gas Company of Hungary repaid some of their loan in 1924, and wiped off the balance this year. The decrease in freehold property in London and abroad is also attributable to the same reasons that I have already set forth under Freehold Land. This, of course, deals with the property which is not actually the site of works—such as offices, and perhaps engineers' houses, and other places, and also our offices in London. The reserve fund investment is altered because we converted our 5 p.ct. War Loan into 4½ p.ct. Conversion Loan. Our pension fund shows no change. English, Colonial, and Indian securities are up by £181,181, because we have made a temporary investment of £200,000 in Treasury Bonds. It is money we shall probably have to deal with next year, when we pay you the final dividend on the German compromise. Next come foreign gas and electricity companies. Here there is an increase of a considerable sum, owing to the investment we have made in the Cie. Continentale du Gaz. They doubled their capital, and called up 25 p.ct., and also a premium of 50 frs. per share. This cost us £178,224. It may interest you to learn what the effect of the exchange is on this Association. In 1924 we had an interim dividend of 6 p.ct. on our holding in the Cie. Continentale du Gaz, which produced 2,589,840 frs., and this translated into sterling amounted to £34,198. In November and December of last year we invested, as I have said, in this Company a further 15,285,550 frs. (£178,224); and the interim dividend in April of this year, which was at the same rate of 6 p.ct., in spite of this additional £178,224 invested, produced only £35,750 (3,244,935 frs.), or about £1600 more than before we put this large further sum into the undertaking. The reason for this is very easily explained. When the dividend came over in 1924, the franc was worth 73 to the pound; whereas in 1925, it was about 20 frs. to the pound more. That will give you a very good illustration of what the depreciation of the franc means to an Association like this. As to the item of "miscellaneous foreign securities," on account of the Belgian law we had slightly to increase our holding there by buying Treasury Bonds, because of their Accident Insurance Laws. On the other side, I have already explained about the debenture stock. Regarding the item of "Sundry stockholders, amounts unclaimed, account reduction of capital," there are a few people who are kind enough still to leave their money with us, instead of taking it. Nothing else calls for mention until we reach the general amortization fund. That is up by £56,836. As I have shown you, there is £59,491 to be put into it, and a few thousands to be taken out on account of the liquidation of Bruex, which I referred to on the last occasion. Sundry creditors are up, because £33,748 more is due to contractors. The item "Commissioners of Inland Revenue" is beyond regret. The renewals fund was drawn upon on account of the liquidation of Bruex, and also to a small extent because of plant that had been scrapped.

Profit and Loss Balance.

Lastly we come to the profit and loss balance, after deduction of interim dividend, available for appropriation. The balance brought from last account was £45,951 6s., and the profit for the year 1924 £230,628 4s. 1d.—making a total of £276,579 10s. 1d. Deducting the 5 p.ct. interim dividend paid in November last, £76,570 12s. 9d., there is a balance available for appropriation of £200,008 17s. 4d. To pay the proposed 5 p.ct. final ordinary and 5 p.ct. centenary bonus dividends, an appropriation of £153,141 5s. 6d. will be required, leaving a carry forward of £46,867 11s. 10d.

The Work of the Staff.

I need not, of course, say that, as usual, I shall be very pleased to answer any questions that shareholders may wish to ask me; and I do not think I should sit down without referring again this year to the wonderful services which have been rendered to us by our staff both at home and abroad. I can only thank them, in the names of myself and of my colleagues, for the good work they have done. [Applause.] I would like to make a special reference to the work of Mr. J. G. Van Niftrik, the Manager at Flushing, the great value of which may be calculated from the fact that the increase in the gas consumption at his station represents an advance of 55 p.ct. as compared with 1913. Mr. Van Niftrik has now retired from the managership at Flushing owing to advancing years, and I am sure he will carry with him your good wishes. He had been with us 35 years, and had been the Association's Manager at Flushing since June, 1889. In accordance with the Association's practice he has been granted a pension. He has been succeeded by Mr. J. J. Van der Jagt, his chief assistant, who has been in the Association's service since November, 1908. There is one other matter to which I should like to allude while I am speaking, and that is the resolution which is going to be proposed later on by a proprietor who has given notice to that effect. The genesis of the motion is that I was approached indirectly by one of the largest proprietors—if not the largest proprietor—in this Association, and was asked whether I did not wish the usual course to be pursued of rewarding the Directors with something on the occasion of the centenary of the Association. Probably this is news to my colleagues; but I do not mind saying now that I declined, on behalf of myself and the Board, without consulting them, to have any such proposal made. At the same time, I pointed out another direction in which something might be done. Of course, we have full scope with regard to our existing staff and their wives. We have a liberal pension fund, and we help them when they are sick and sorry; but there are other occasions you can very easily imagine that arise. For instance there might be a man with a moderate salary who perhaps had not "cut his coat according to his cloth," and had a somewhat larger family than he ought to have had considering his means. Such a man might find that a little assistance towards the education of his youngest daughter or his eldest son would be of great value to him; but we, having no precedent, and no wish, to go outside our usual scheme of gratuities or pensions for sickness, have naturally to refuse to assist in these cases. Therefore I said: "If you wish to do anything to mark appreciation of the services of the Directors and the staff during this long period of a hundred years, I think that if a proposal were made to place a modest sum"—I did not wish to frighten proprietors by mentioning too large an amount—"at the disposal of the Board for this purpose, it would be practically certain to receive the assent of the shareholders." ["Hear, hear."]

The Dividends.

I have now to move:

> That the sum of £388,903 8s. 1d. received from the realization of the German assets, being an accretion to capital which has been realized and turned into money, be dealt with as profit and applied in payment of a special dividend for the year 1924, at the rate of 19½ p.ct. per annum on the nominal amount of the issued capital stock of the Association, such dividend to be paid on the 26th of May, 1925, upon the holdings of capital stock as registered in the books of the Association on the 27th of April, 1925.

The Deputy-Chairman: I beg to second that.

The motion was put to the meeting, and carried unanimously, without discussion.

The Chairman: I next have to move:

> That upon the holdings of capital stock as registered in the books of the Association on the 27th of April, 1925, there be also paid on the 26th of May, 1925, less income-tax at 4s. 6d. in the pound—
>
> (*a*) A final ordinary dividend for the year ended the 31st of December, 1924, at the rate of 5 p.ct. (actual), making with the interim dividend of 5 p.ct. (actual) paid in November, 1924, a dividend of 10 p.ct. for the year.
>
> (*b*) A special bonus dividend, in celebration of the Association's centenary, at the rate of 5 p.ct. (actual),

Leaving £46,867 11s. 10d. to be carried forward to the next account.

The Deputy-Chairman seconded this, and it was agreed to.

The Chairman: Now I have to move:

> That the accounts, together with the scheme for the appropriation of the profits, which have been submitted, be received, adopted, and entered upon the minutes.

The Deputy-Chairman seconded this, and it was carried.

A Memorial of Gratitude.

Mr. H. E. West: I have much pleasure in moving the next resolution. The usual notice has been given, and I have reason to believe that it will prove acceptable to the shareholders. You will appreciate the Chairman's unselfishness in deciding that, if any money were voted, it should be devoted to the staff, and not to the Board. Few companies are spared to celebrate their centenaries, and the record of this Association is, I believe, unique. This record is the result of an able and far-seeing policy on the part of the Board, helped by a capable and loyal staff. I beg to move:

> That a sum of £2000 be placed at the disposal of the Board to be utilized for the permanent endowment of such philanthropic object as they may select having as its primary object the extension of assistance to deserving cases occurring among the families of employees of the Association; the said endowment

to be an abiding memorial of the proprietors' gratitude to the Directors, past and present, for the valuable services rendered by them to the Association during the period 1824 to 1924.

Sir Lucas Ralli: I have much pleasure in seconding that.

Mr. Fred. Tomkinson: I wish to support this resolution, and also to express my thanks for the extremely able speech we have had from the Chair. I think we owe a deep debt of gratitude to the Directors for the work they have done during the past year. My main object in rising, however, is to refer to the excellent booklet entitled "The Centenary of the Imperial Continental Gas Association" which was sent out with the report and accounts. It shows the very remarkable result of the hundred years' work; and I would like to thank the Board for giving us so charming a memento of the occasion.

The resolution was passed with acclamation.

Re-Elections.

The Chairman: I beg to move the re-election of the following Directors, who are all old and tried administrators of the Association. Col. H. LeRoy-Lewis, C.B., C.M.G., D.S.O.; Mr. R. W. Wilson; and the Rt. Hon. Sir Guy D. A. Fleetwood Wilson, G.C.I.E., K.C.B., K.C.M.G.

Mr. H. G. Palmer seconded the motion, which was unanimously agreed to.

Mr. C. F. Dendy Marshall, M.A., was re-elected an Auditor of the Association, on the proposition of Mr. Percy de Worms, seconded by Sir Lucas Ralli.

A vote of thanks to the Chairman and Directors, proposed by Mr. Tomkinson, was carried with applause, and suitably acknowledged by the Chairman.

Note.—It is of interest to record that at this meeting in the centenary year there were present three direct descendants of the original founders of the Association—*i.e.*, Mr. Harold Godfrey Palmer, Mr. George Jessel, M.C., and the Reverend Canon Attwood.

BRENTFORD GAS COMPANY'S STANDARD PRICE.

The Public Control Committee of the London County Council, reporting that the Board of Trade have issued an Order providing that, as from April 7, the standard price of the Brentford Gas Company is to be reduced from 17·8d. to 14d. per therm, point out that this decision is the mean of the Company's and the Council's estimates. The effect of the award on the authorized dividends payable by the Company is shown below:

—	"A" Consolidated Stock.	"B" Consolidated Stock.
Amount of stock	£992,045	£990,500
Standard rate of dividend	4 p.ct.	3½ p.ct.
Rate of dividend authorized and paid in 1914	£5 14s. p.ct.	£5 12s. 6d. p.ct.
Rate of dividend for 1924:		
Authorized	£8 p.ct.	£8 10s. p.ct.
Paid	£6 2s. p.ct.	£6 2s. 6d. p.ct.
Maximum rate of dividend payable under Board of Trade's award at present price of gas (9·8d. a therm)	£6 2s. p.ct.	£6 2s. 6d. p.ct.

It will, they add, be seen that the new standard price will allow the payment of dividends substantially greater than those authorized before the war, assuming that the actual price charged will remain at 9·8d. a therm. It must be remembered, however, that the shareholders are entitled to additional dividend in respect of their share of any savings effected by the Company by good management. If the Company's estimate of 0·36d. a therm as the equivalent of such savings is correct, the corresponding increase of dividend to which the shareholders are entitled in this respect may be put at 4s. p.ct. on the "A" stock and 5s. p.ct. on the "B" stock.

STAFFORD GAS UNDERTAKING.

The report of the Stafford Gas Committee for the year to March 31 shows a gross profit of £13,743, which leaves an available profit of £1175. The gas made amounted to 325 million c.ft.—a slight increase on the make for the previous year.

Alderman Young (Chairman of the Committee), in moving the adoption of the report, drew attention to the fact that the price of gas had been reduced on two occasions during the year. The low prices at present charged, he suggested, would assist in developing the town. The Committee and Council were to be congratulated on having such an asset in their well-managed undertaking. Since Mr. Poulson had been in charge, the results had been excellent, and improved as time went by.

Alderman Westhead seconded, and emphasized that more gas had been supplied to the consumers during the year, in consequence of the reduction in price.

Synthetic Ammonia.—The recent announcement of a guarantee of £2,000,000 under the Trades Facilities Act as new capital for Synthetic Ammonia and Nitrates, Ltd., indicates great expansion of the undertaking, set up at Billingham, near Stockton-on-Tees, by a subsidiary company of Messrs. Brunner, Mond, & Co., for making ammonia from atmospheric nitrogen. The works at Billingham will be extended to four or five times their present size; and the output, restricted at present to 120 tons of sulphate of ammonia per day, will approach 800 tons daily.

NOTTINGHAM GAS PROFITS.

£88,545 Last Year.

The annual report of the Nottingham Corporation Gas Committee for the period ended March 31 shows that the undertaking is enabled to contribute £25,000 in relief of municipal burdens.

In contrast with the record for remunerative results, which was established in 1923, when the profits totalled £181,367, and also in comparison with those of 1924, which aggregated £165,502, the amount now available is £88,545. But, as Sir Albert Ball (Chairman of the Committee) observed, in moving the adoption of the report by the Council, it is a cause for satisfaction that the undertaking has done so well in a period which has been beset with difficulties. He referred to the shrinkage of residual prices, the most salient example of which was that the income from tar products had gone down by £28,053.

The Committee's report, which was adopted, afforded much interesting information indicative of continued effective management. The income last year amounted to £645,204, and the expenditure to £556,659, leaving a balance of £88,545 to be carried to the profit and loss account. To this balance is added £3572, representing bank interest and interest on revenue account investment, together with £50,208 brought forward from last year. After charging interest on capital, contributions to sinking funds, and £15,000 for depreciation of mains, meters, and stoves, there remains an available balance of £62,441. The Committee, having decided to allocate £25,000 as a contribution in aid of the general district rate, recommended that the balance of £37,441 be carried forward. A considerable tonnage of coal has still to be taken under the contracts, and the prices payable thereon will, it is pointed out, have a material effect upon the accounts for next year. New contracts are being made for a limited tonnage at lower prices, but, even now, the Committee observe that gas coals are not purchasable on the same terms as other industrial coals; the lower prices for industrial fuels being due entirely to the general depression in trade. The average price paid for coal, 24s. 1·33d. per ton, showed an increase of 7·53d. per ton on the previous year. The average price paid for the year ended March, 1914, was 11s. 5·55d. per ton.

The Committee, for some considerable time past, have been of opinion that the period would arrive when abnormally high prices for coal, materials, and labour would coincide with a severe depression in the markets for residuals. Unfortunately this period has now arrived, and the Committee consider it necessary to inform the Council that an increase in the price of gas cannot be avoided if the present conditions continue for an extended period. However, having regard to the severe depression prevailing in industry, the Committee do not recommend any increase in the charges for gas, advising that the existing scale shall remain in operation for the time being, even if, in so doing, an actual trading loss is made.

The quantity of gas sold during the past year in Nottingham and district was 2,571,307,200 c.ft. (12,213,709 therms), compared with 2,560,574,300 c.ft. (12,162,728 therms) for the previous year—an increase of 10,732,900 c.ft. (50,981 therms). The quantity of gas sold per ton of coal carbonized was 12,704 c.ft. (60·3 therms), as compared with 13,128 c.ft. (62·3 therms) last year. The decrease is due to the extended use of local coals and a slight improvement of the calorific value of the gas supplied.

The following figures show the difference between present-day and pre-war costs in relation to the undertaking:

Year Ended	Gas Sold (C.Ft.).	Total Expenditure. £
March, 1925	2,571,307,200	556,660
March, 1914	2,251,302,700	250,995
Increase	320,004,500	305,665

It is pointed out by the Committee that the expenditure per million cubic feet of gas sold has therefore increased from £111 9s. 9d. for the year ended March, 1914, to £216 9s. 9d. for the year ended March last—an increase of 94 p.ct. The following are the comparable receipts for gas per 1000 c.ft. sold for the same periods:

	s. d.
March, 1925	3 5·30
March, 1914	2 5·17
an increase of	1 0·13, or 41·58 p.ct.

Mr. John Wilkinson's Report.

In his fourteenth annual report, Mr. John Wilkinson (the Engineer and Manager) affords the information that during the period under review 196,198 tons of coal and 133,723 gallons of oil were utilized in course of manufacturing:

	C.Ft.	Therms.
Coal gas	2,588,362,000	12,317,461
Water gas	81,843,000	390,016
Total	2,670,205,000	12,707,477

The gas unaccounted-for during the year was 98,897,800 c.ft. (493,768 therms), or 3·70 p.ct., as compared with 3·69 p.ct. for the previous year.

Montevideo Gas and Dry Dock Company, Ltd.—At the meeting next Wednesday (May 27) the Directors will report that, after providing for interest on debenture stock and other charges, and including £14,401 brought forward from the previous year, the balance at the credit of profit and loss available for dividend is £36,074. A dividend of 2 p.ct., free of income-tax, is recommended, making, with the interim distribution, a dividend of 4 p.ct., free of income-tax, for the year. This will leave a balance to be carried forward of £14,397. Compared with the previous year, the total sales of gas show an increase of 8½ p.ct. The extension of the manufacturing plant has been continued, and enlargement of many of the mains is in progress.

CITY AND GUILDS OF LONDON INSTITUTE.

The following questions were set in the City and Guilds of London Institute Examinations in the subjects named:

GAS-WORKS PRACTICE.

Grade I.

(Not more than eight questions to be attempted. The maximum number of marks obtainable is affixed to each question.)

1. Sketch and describe the producer used for heating a regenerative setting of horizontal retorts. (45.)
2. Describe, with the aid of sketches, how the gas passes from the retort to the foul main. (45.)
3. Describe the operation of clinkering the producer of a retort setting. (35.)
4. Sketch and describe one form of apparatus for removing traces of tar from the gas after it leaves the condenser. (35.)
5. What impurities are present in the crude gas after it leaves the condenser, and how are they removed? (35.)
6. Give a sectional sketch of an oxide purifier, and explain the chemical action in the purifier and during the revivification of the oxide. (35.)
7. Describe an apparatus for ascertaining (*a*) the specific gravity, and (*b*) the calorific value, of coal gas. (35.)
8. Sketch and describe the apparatus used for making carburetted water gas. (35.)
9. Describe, with the aid of sketches, the following parts of a gas-holder: (*a*) Top curb, (*b*) vertical stays, (*c*) cup and dip, (*d*) bottom curb, (*e*) inlet and outlet pipes. (30.)
10. What is the function of the station governor? Explain its construction and working. (30.)

Final Examination.

(Not more than eight questions to be attempted. The maximum number of marks obtainable is affixed to each question.)

1. Sketch a cross-section of a modern retort house equipped with regenerative retort settings, stoking machinery, and coal and coke handling plant, describing briefly the various apparatus used. (45.)
2. Sketch and describe a blue water gas plant fitted with waste-heat boiler. (35.)
3. Describe the method of starting-up a carburetted water gas plant from cold. (35.)
4. Discuss the probable composition of coal gas having a calorific value of 560 B.Th.U., and how it would be modified by the addition of 25 p.ct. of blue water gas. (45.)
5. Describe the construction and working of a sulphate of ammonia plant, making special mention of the working conditions of the saturator. (35.)
6. Describe the methods of sampling and testing the producer gas and waste gases of a regenerative retort setting. (35.)
7. Describe, with the aid of sketches, a modern coke breaking and screening plant. (35.)
8. Discuss briefly the test used for chemical control in a gas-works. (35.)
9. Prepare a skeleton specification for a tank 60 ft. diameter by 25 ft. deep, suitable for storing oil for the manufacture of carburetted water gas. (30.)
10. Describe the apparatus used for determining the composition of illuminating gas. (30.)

GAS SUPPLY PRACTICE.

Chief Examiner: Mr. H. Kendrick.

Grade I.

(Not more than eight questions to be attempted. The maximum number of marks obtainable is affixed to each question.)

1. State fully the comparative advantages and disadvantages of cast iron, wrought iron, and steel for street mains and services. For what pressures is each most suitable? (30.)
2. Describe fully the operation of temporarily stopping a leakage in a 6-in. main. How would you deal permanently with a split main, a split socket, and a main broken completely round? Give sketches in each case. (35.)
3. (*a*) How does temperature and atmospheric pressure affect unaccounted-for gas? What other factors influence the volume of gas paid for, as compared with the volume of gas made. (30.)

or

(*b*) Describe and sketch the following: (i.) A ratchet stock, (ii.) an anti-pulsator, (iii.) a thermostat, (iv.) a gas-main expansion joint. (30.)

4. Sketch and describe an efficient street lamp governor. How may unsatisfactory governors affect the efficiency of inverted burners? (35.)
5. (*a*) What are the chief factors to be allowed for when fixing the diameter of pipes for internal fitting work? State the maximum allowable cubic feet of gas per hour, and the maximum length advisable in gas fitting work for $\frac{3}{8}$-in., $\frac{1}{2}$-in., $\frac{3}{4}$-in., and 1-in. lead, compo, and iron piping. (40.)

or

(*b*) How may very small leakages be shown in interior fitting work? Sketch in detail the apparatus you would use, and state how you would locate such a leakage in a confined space. (30.)

6. What appliances are required for the official testing of meters? State in general terms the regulations under which these tests are made. What are the limits of error allowed? (30.)
7. How would you prove that the pressure of gas at a meter outlet is adequate for the requirements of a particular consumer? What is the minimum pressure allowed by the Gas Regulation Act? Where should this be ascertained? Is this pressure adequate for the needs of the average consumer? If not, what pressure is desirable to ensure the best results for lighting and heating? (30.)
8. Sketch and describe the working and construction of a dry gas meter. What are the chief parts upon which the accuracy of registration depends, and the parts that affect the gas pressure if the meter is overworked? (40.)
9. (*a*) Why do oven burners sometimes "smother out"? Can this be prevented? What means would you employ for ascertaining whether the ventilation of the oven was deficient or excessive? (30.)

or

(*b*) Describe fully the cycle of operations in the cylinder of an "Otto" type gas engine. If a gas engine slowed down and finally stopped, how would you locate the fault or faults, and then remedy them? (40.)

10. (*a*) Explain with sketches the correct form of bunsen flame for (i.) a "C" burner, (ii.) an inverted burner, (iii.) a gas fire. What alterations, if any, would be necessary to maintain the same maximum efficiency when consuming horizontal straight coal gas, vertical gas, and mixed gases, each of 480 B.Th.U. calorific value? (40.)

or

(*b*) During the war, various devices were used in connection with the burners of cookers already installed, to overcome the tendency to light back. Describe and sketch two of these. How did they effect the desired object? Would they be useful in present circumstances, and, if so, why? (35.)

11. (*a*) A consumer complains that his gas fire does not give sufficient heat, and an objectionable smell is given off from the gas iron when first lighted. What are the probable causes and remedies for the complaints? (35.)

or

(*b*) Describe and sketch the operation of tapping and connecting a service pipe to a steel main. What precautions have to be taken to prevent damage to the main pipe during the work and after it is completed? (30.)

Final Examination.

(Not more than eight questions to be attempted. The maximum number of marks obtainable is affixed to each question.)

1. State in general terms the regulations governing the powers of authorized and unauthorized gas undertakings to break up dedicated and undedicated streets for the purpose of laying mains. (40.)
2. An 8-in. diameter main is increased in length from 1200 yards to 3600 yards. To what must the initial pressure of 2 in. be increased to ensure the same discharge of gas? Upon what formula is the answer based? (30.)
3. (*a*) Describe and sketch an apparatus for reinforcing the general supply of gas in a low-lying district where the consumption is mainly domestic. Is it necessary to work the plant continuously over the 24 hours? Sketch 24-hour charts of the booster outlet pressures for a mid-summer and a mid-winter day for an area as above stated. (35.)

or

(*b*) A railway company has demanded that gas undertakings on its system shall fix by-passes to meters supplying its goods yards and junctions, which are to be opened should the meters break down. Why is this undesirable from the gas undertakings' point of view? Could not the feared difficulty be met in a manner less open to objection? (40.)

4. (*a*) How do the regulations for testing meters differ under the Gas Regulation Act, 1920, and under the Sales of Gas Act, 1859? In what way are the new regulations to the advantage of the gas undertakings and the consumer? (30.)

or

(*b*) A bridge of 60 ft. span has been constructed over a river. The roadway is carried on box girders 3 ft. 6 in. deep and 6 ft. centre to centre; the floor being formed of reinforced concrete slabs, leaving 18 in. between the bed and the flags forming the footway. The roadway rises 1 in 10 to the bridge on both sides. Show in detail two methods by which you would carry a 24-in. diameter main across the bridge, and how you would provide for contraction and expansion. (40.)

5. (*a*) What precautions are necessary when fixing and adjusting pneumatic switches in order to ensure satisfactory results? Describe how you would carry out an installation in a cinema, and what provision you would make to prevent extinguishing of the by-passes. (30.)

or

(*b*) What does "co-efficient of friction" mean? What was Dr. Pole's constant? Is this correct? If not, state the variations for 2-in., 6-in., 12-in., and 24-in. diameter cast-iron mains. (35.)

6. (*a*) State the methods that you would adopt to revive (i.) a man who had been badly gassed by inhaling straight coal gas, and (ii.) a man who had been badly gassed by inhaling a mixed gas containing 30 p.ct. of water gas. (30.)

or

(*b*) Discuss the relative merits of compression of (i.) gas, (ii.) gas and air, (iii.) air only, in high-pressure lighting and furnace work. (30.)

7. (*a*) State what you know about bread and biscuit baking by gas. What are the relative costs for fuel and labour in a large and in a small installation when using gas and solid fuels? (40.)

or

(*b*) Sketch and describe a regenerative oven furnace for hardening, reheating, and annealing steel castings. State the average consumption of gas per cwt. of steel, and its economy in costs over solid fuel when used for annealing, exclusive of the fuel used for the primary heating of the furnaces. (35.)

8. (*a*) Sketch and describe a Spencer-Bonecourt boiler capable of evaporating 700 lbs. of steam per hour from 212° Fahr. How

does chimney draught affect the production of steam? What are the comparative costs of raising steam by this type of boiler and by Lancashire boilers, taking into consideration capital, fuel, labour costs, and repairs? (40.)

or

What are the advantages and disadvantages of flue pipes used in conjunction with gas cooking stoves?

Some recent tests of gas fires referred to during the Smoke Abatement Exhibition in Manchester last autumn showed the presence of carbon monoxide in the flue gases. Would this be dangerous to health? Discuss these statements. (35.)

The ordinary type of multiple nipple burner for street lighting a group of small mantles set in more or less circular form. Does ensure even lighting along and across a narrow street? Give a led sketch and description of a burner now on the market that improvement on this general design and lighting effect. (30.)

(*a*) State what you consider to be the chief advances in gas-fire construction during the past ten years, as shown by the designs submitted by the makers, and mention the causes which have led to the improvements enumerated. (35.)

or

What purposes do indicator diagrams serve in gas engine practice. Sketch such diagrams, and explain the effect on the respective curves of (i.) a choked exhaust pipe, (ii.) too small a supply of air, (iii.) the pre-ignition of the mixture. (35.)

(*a*) How may the variations of flame temperature be measured? State briefly a method of estimating radiant energy from a gas fire. (30.)

or

What proportion of light rays from an inverted burner are radiated above the horizontal; and how is this ascertained? What means are adopted in the construction of street lanterns for ensuring the greatest efficiency and evenness of lighting on the road surface? (30.)

LIGHTING OF LONDON SCHOOLS.

n the annual estimates for fuel, gas, electricity, and water, 3,050, and for building work not chargeable to capital account, 2,000, being submitted at last meek's meeting of the London nty Council, Mr. C. E. GIBBINGS moved that it be referred to the nce and Education Committees to consider and report as to the aration of a supplemental estimate of £1000 with a view to ring improved lighting at certain schools. In moving the amend-t, he drew attention to the inefficient lighting of some of the old ols in Southwark, and said that in certain rooms there were 16 burners that were put there 20 or 30 years ago. As a business osition it would be quite right for the Council to have these things ed, in order to give a much better light. In the lighting bill e it would save about 50 p.ct.

r. HERBERT MORRISON, seconding, thought the day was not far nt when no more gas lighting would be left in London schools. present lighting of schools was disgraceful, and had a bad effect the health of children, teachers, and other people using the ldings. The Council might be able to obtain very favourable s from municipal electricity undertakings for the installation of tricity in place of gas in the schools, if they could offer those rtakings an increased load for other purposes—such as electric vers.

rs. WILTON PHIPPS (the Chairman of the Education Committee) sed to accept the amendment, on the ground that the Committee sufficient money at their disposal to carry out any improvements ssary. She agreed that the lighting of some of the schools was bad. The question was under the consideration of the Buildings Committee; and she was very anxious that the illumination ld be improved. In the case of the old schools, she was afraid substitution of electricity for gas would be a slow process; but he new schools electricity would certainly be used.

he amendment was defeated by 69 votes to 28, and the estimate pted.

GAS SUPPLY IN SINGAPORE.

he report for 1924 of the Municipality of Singapore Gas Depart-t will be the last to bear the signature of Mr. J. P. Hallaway as Engineer; for he retired in February from the position, which had held for 23 years, and has been succeeded by Mr. F. Bedford, was appointed Assistant Gas Engineer in 1922. In Mr. Bedford Commissioners will, Mr. Hallaway says, "have a very experienced hard-working officer, who can be depended upon to further their rests and the development of the Gas Department."

he report shows that the quantity of gas manufactured in 1924 271,845,000 c.ft. (including 39,526,000 c.ft. of water gas), which pares with 267,970,000 c.ft. for 1923, an increase of 1·4 p.ct. the output, 30·8 p.ct. was used for public lighting. To private sumers 3·6 p.ct. more gas was sold than in 1923; and the number consumers increased by 105 during the year. The number of king, water heating, and other appliances fixed on hire grows sfactorily; and Mr. Hallaway is of opinion that the use of gas these purposes, as well as for industrial operations, will rapidly ease. The amount of gas accounted for was 12,801 c.ft. per ton coal, against 11,758 c.ft. for 1923. A very satisfactory reduction accomplished during the year in the proportion of unaccounted-gas; the figures being 10·7 p.ct. in 1923, and 7·5 p.ct. for 1924. When Mr. Hallaway took charge in 1902, the make of gas per ton was 44,659,000 c.ft.

The Bradford Corporation Gas Committee have allocated £10 for l prizes in connection with the usual "Fairy Gas" competition anized among school children by the "B.C.G.A."

THE SMOKE NUISANCE.

Dealing with the question of smoke and atmospheric pollution, a table is given in the report of the Medical Officer of Health for the City of London for 1924 showing the rainfall from January to December and the amounts of insoluble matter—tar, soot, and dust—found, also the soluble matter, together with the sulphates, ammonia, and chlorine in the volume collected. A comparison is made with Lambeth (Archbishop Park); and only in May and December did the solids at Lambeth exceed those in the City. It is pointed out that, in July only, the deposit registered as falling in the City amounted to 20·96 tons per square kilometre, which is equal (estimating the City as having an area of one square mile) to no less than about 53·6 tons. Of this mass of dirt, approximately 24·9 tons were soluble, and included the chemicals mentioned, and 28·7 tons were insoluble, and consisted of tar, carbon, and grit.

In addition a daily observation had been made at mid-day at the Guildhall of the purity of the air by a modern dry method, by which the suspended matter could be readily demonstrated. From Jan. 1 until Dec. 31 the amount of the impurity at noon had varied from half a milligramme to six milligrammes per cubic metre of air; this latter figure including times of fog.

Commenting on this, the Medical Officer adds: "For many years past it has been increasingly obvious that the use of electricity and gas for heating and cooking purposes is contributing to the diminution of the nuisance from smoke. The cost of electricity is still far too great for its general use, but I believe the substitution of gas for coal and coke in restaurants and business premises is practicable, and might be more generally adopted if the gas companies encouraged its greater use, possibly to their own profit, and certainly to the advantage of the populace, by arranging a special rate for the supply to premises of the class indicated. Were such special terms for gas as those suggested arranged, I am of opinion that the increased purity of our atmosphere, as would be observed by City workers, would be so marked that an agitation against the unnecessary use of common coal would result, and public opinion might even extend to statutory prohibition being enforced."

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *May* 18.

Pitch continues nominal at about 41s. to 42s. per ton.

Attention is now concentrated on tar for road work, and considerable quantities are being delivered.

Creosote is displaying a slightly firmer tendency at about 7d. to 7⅛d. per gallon net and naked at makers' works.

Solvent naphtha is in good demand and scarce at about 1s. 8d. to 1s. 9d. per gallon for 95-160 quality.

Pure benzole and pure tuluole are about 2s. per gallon.

Tar Products in the Provinces.

May 18.

The markets for tar products are practically unchanged.

In pitch there is little or no business now doing for prompt delivery. It is probable that the present spell of hot weather will definitely stop any further purchases being made for delivery this season, and it may be that it will result in some quantity sold for delivery this season being carried forward to next. As regards next season, some business has been done on the East Coast at 41s. a ton f.o.b., and in London at 41s. 6d. to 42s. Reports from the Continent are to the effect that considerable quantities of continental pitch have been sold for next season at prices which at to-day's rate of exchange certainly do not amount to more than 40s. f.o.b. England. Some business is reported to have been done on the Continent in British pitch at 42s. and 42s. 6d. a ton f.o.b.

Creosote oil is quiet in the absence of any foreign demand. It is known, however, that little or no business has been done for July-December. A considerable quantity has to be purchased, as stocks on this side are quite small. Present prices should be maintained, or even some improvement effected. In the meantime, small quantities have been sold at rather less than the figures which have been recently ruling.

White products are steady. As usual, there is a very good demand for benzole for motor purposes, while solvent naphtha is in increased demand owing to the activities of the rubber trade. Both crude carbolic and cresylic are neglected, while naphthalene is almost unsaleable.

The average values for gas-works products during last week were: Gas-works coal-tar, 27s. to 32s. Pitch, East Coast, 40s. 6d. to 41s. 6d. f.o.b. West Coast—Manchester, 35s. to 36s.; Liverpool, 36s. to 37s.; Clyde, 39s. to 40s. Benzole, 90 p.ct., North, 1s. 7½d. to 1s. 8½d.; crude, 65 p.ct., at 120° C., 11d. to 1s. 1d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 7½d. to 1s. 8½d. Toluole, naked, North, 1s. 6½d. to 1s. 7½d., nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8½d. Solvent naphtha, naked, North, 1s. 5d. to 1s. 6d. Heavy naphtha, North, 1s. to 1s. 2d. Creosote, in bulk, North, liquid, 5⅝d. to 6¼d.; salty, 5⅜d. to 6d.; Scotland, 5⅝d. to 5⅞d. Heavy oils, in bulk, North, 6½d. to 7d. Carbolic acid, 1s. 5d. to 1s. 6d. prompt. Naphthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Cape Town and District Gas Company.—At to-day's meeting of the Cape Town and District Gas Light and Coke Company, Ltd., satisfactory progress will be reported. A final dividend will be recommended on the ordinary shares of 4 p.ct., making 7 p.ct. for the year; and this will leave £3820 to be carried forward.

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

Apart from a rather steadier position in Northumberland steams, there is little of interest to report from the Newcastle market. Durham coals are, if anything, rather weaker, and the demand shows no signs of improving. It is reported this week that unsold stocks in Germany amount to eight million tons, and pressure by some of the banks which are financing these enormous quantities is said to be causing many concerns to accept almost any price. With the concessions in railway rates recently granted to the German mines, therefore, the tendency is for competition against English exports to become more and more severe.

Some of the Northumberland collieries are well booked for a week or two ahead; but in Durham it is still generally a hand-to-mouth existence. Wear Specials and best-quality gas makers quote 19s. f.o.b.; but many brands are obtainable at considerably less than this, especially for loading terms which suit them. Seconds are nominally 17s. The demand for coking is negligible, and prices are 16s. 9d. to 17s. 3d., while best quality bunkers are hard to maintain at 17s. 6d. to 17s. 9d.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

Gas coals generally have been booked much earlier than usual this year. Several inquiries on the market are to be decided before the end of the month in respect of deliveries to commence at the beginning of August or September, so that it will be seen that the buyers are not prepared to wait until there may be an alteration in present-day conditions and prices before completing their purchases for next year. Prices as a rule show a reduction of 2s. to 3s. per ton as compared with last year.

The warmer weather has caused a reduction in the demand for household coal, and it is just possible that irregular working of collieries will result. If this is so, there will be a tendency for the price of industrial fuels, especially small hand slacks, to rise a little above the low figures that have prevailed for some months.

There is no change in the demand from the industrial coal consuming centres, although in the clothing trades it is anticipated that they will show better results during the next few months. The iron and steel trades, however, are still depressed.

The slump in shipping continues, although South Yorkshire hards are keeping firm in comparison with other grades. This undoubtedly will be the position for some weeks, as the Doncaster Races and the approaching Whitsuntide holidays will, as always, have a steadying effect on this particular grade.

Prices at Hull at the week end (f.o.b. usual shipping ports) were: South Yorkshire—Hards, Association, 20s. to 20s. 9d.; screened gas coal, 18s. 6d.; washed trebles, 20s.; washed doubles, 17s. 6d.; washed singles, 16s. to 16s. 6d.; washed smalls, 12s. 3d. to 12s. 6d.; unwashed doubles, 16s. 6d.; rough slack, 10s. 6d. to 12s.; and smithy peas, 19s. to 20s. West Yorkshire—Hartleys, 17s. to 18s.; screened gas coal, 18s.; washed trebles, 18s.; washed doubles, 16s. to 17s.; washed singles, 15s. 9d. to 16s. 3d.; washed smalls, 11s. 6d.; unwashed trebles, 17s. to 17s. 6d.; unwashed doubles, 13s. to 14s.; rough slack, 10s. 6d.; and coking smalls, 9s. Derbyshire and Notts—Top hards, 19s. 6d. to 20s.; washed trebles, 17s. to 19s.; washed doubles, 16s. 6d. to 17s.; washed singles, 15s. 3d. to 16s.; washed smalls, 11s. 6d. to 12s.; unwashed doubles, 14s. to 15s.; rough slack, 10s. 3d. to 10s. 9d. Yorks, Derbys, and Notts—Screened steam coal, 15s. to 17s.; gas coke, 21s. 6d. to 24s.; furnace coke, 15s. 6d. to 16s. 6d. per ton.

In Lancashire, industrial unscreened coal is 21s. at the pits, and the best qualities of Lancashire slack are from 15s. to 17s. per ton.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

A number of gas undertakings have already negotiated contracts for the new year's supplies. They are able to buy at 2s. to 3s. below the rates which have applied in the term now drawing to a close, the fall varying according to quality. Yorkshire gas coal, which was priced at 21s. to 22s. under the old contracts, is now selling at 18s. to 19s. The gas-works are not likely to be much better off, however, when against these savings is set the depreciation in coke and residuals, not to mention the acceptance of undelivered balances on the old high-priced contracts. Undertakings which have a considerable surplus of coke are now selling at 18s. to 20s. in order to rid themselves of the output, though in centres where the industrial demand is relatively heavy the price may run up to 24s. or 25s. There is no improvement whatever in the call for works fuel. Cannock Chase steams can be bought at 15s. at the pits.

The house coal trade has been maintained more regularly than usual this spring. It has now collapsed; and the situation of a large number of Midland pits which have been comparatively well employed has changed for the worse. Some of the merchants have not been able to clear stocks put down at the wharves, and appreciable loss in liquidation are almost inevitable.

The men employed at the Birchenwood Colliery, North Staffordshire, have rejected the proposal for the formation of a trust fund to continue the working of the pits on a co-operative basis. The well-being of Kidsgrove depends almost entirely upon the colliery, and the local authority is urging the Government in the public interest to intervene to avert a stoppage.

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STOCK MARKET REPORT.

: failure of the New Zealand Loan issue, owed by the underwriting of the proposed 000,000 London County Council Loan to issued on precisely the same terms, had an erse effect on all investment stocks. In case of the New Zealand Loan, the under- ers were left with 85 p.ct. of their com- nents, so that the prospects of the Coun- Loan are not encouraging. The impetus ed for by the reduction in the income-tax not materialized; investors adopting a sive attitude. Foreign Government stocks recovered slightly at the end of the week, but French loans continued in a depressed state, and there is little hope of any material improvement for some time to come.

Industrial shares were more unsettled than usual, Rubber shares alone being the exception. With the price of the raw material rising to 2s. 7d. per lb., a keen demand took prices up with a run. Mining shares, although generally quiet, were well supported. In the Platinum group T.C.L.'s rose $\frac{3}{16}$ to $4\frac{7}{16}$ on rumours of fresh developments.

ssue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. May 15.	Rise + or Fall − on Week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
1,978	Stk.	Feb. 5	5	5	Aldershot 5 p.c. max. C. .	78—81	..	..
5,492	,,	,,	4	4	Do. 4 p.c. Pref. . .	71—76	..	..
1,868	,,	Apl. 2	6½	6½	Alliance & Dublin Ord. .	66—71	..	..
4,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb. . .	63—68	..	..
0,000	5	May 7	8	8	Bombay, Ltd.	4⅞—5⅛*	..	5
0,000	10	Mar. 5	8½	8½	Bournemouth 5 p.c. . .	12—13	..	..
5,050	10	,,	7	7	Do. B 7 p.c.. .	12½—12⅝	..	12½—12⅛
0,000	10	,,	6	6	Do. Pref. 6 p.c.. .	11—12	..	..
0,000	Stk.	Jan. 8	3	3	Do. 3 p.c. Deb..	56—59	..	..
2,025	,,	,,	4	4	Do. 4 p.c. Deb..	78—81	+2	79
2,045	,,	Mar. 5	6 7/10	6 7/10	Brentford A Con. . . .	95—105	..	97
0,500	,,	,,	6⅝	6½	Do. B New . . .	95—105	..	96
6,000	,,	,,	5	5	Do. 5 p.c. Pref. . .	95—98	..	95
6,569	,,	Dec. 18	4	4	Do. 4 p.c. Deb. . .	76—81	..	77¼—79½
1,337	,,	,,	6	6	Do. 6 p.c. Rich. Red. Deb.	100—105	..	..
4,740	,,	Mar. 5	12½	12½	Brighton & Hove Orig. .	165—170	..	..
4,200	,,	,,	8½	9½	Do. A Ord. .	122—125	..	124½—125
7,500	,,	Feb. 19	8	8	Bristol 5 p.c. max. . . .	96⅞—97½	..	..
5,000	,,	Mar. 19	8	7	British Ord..	110—115	..	..
5,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref.. . .	123—128	..	124
0,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. .	72—77	..	..
0,000	10	Dec. 18	8	6	Cape Town, Ltd. . . .	7—8	..	..
0,000	10	Apl. 23	4½	4½	Do. 4½ p.c. Pref.. .	6—7	..	6
50,000	Stk.	Dec. 18	4½	4½	Do. 4½ p.c. Deb.. .	71—76	..	..
26,860	,,	Feb. 19	6	6	Cardiff Con. Ord. . . .	101—104	..	..
37,860	,,	Jan. 8	7½	7½	Do. 7½ p.c. Red. Deb..	104—107	..	..
37,150	,,	Feb. 19	5	6½	Chester 5 p.c. Ord. . . .	89½—94½b	..	..
13,280	,,	Mar. 5	6	5/14/8	Commercial 4 p.c. Cap. .	86—89	..	..
50,000	,,	,,	6	5⅜	Do. 3½ p.c. Cap. .	86—89	..	..
75,000	,,	Dec. 18	3	3	Do. 3 p.c. Deb.. .	57—60	..	..
20,000	,,	14 Jan. 15	—	—	Continental Union, Ltd. .	35—40	..	37
20,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref. .	88—92	..	..
50,000	,,	Mar. 5	6½	6½	Croydon sliding scale . .	98—102	..	..
34,975	,,	,,	5	5	Do. max. div.	83—86	..	83—84
32,870	,,	Feb. 19	6	9	Derby Con.	110—112c	..	..
55,000	,,	Jan. 8	4	4	Do. Deb.	74—76c	..	..
02,180	1	Jan. 22	6	4	European, Ltd.	7—8	..	7—7⅛
60,070	Stk.	Feb. 19	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	83—85	−½	83—84
20,000	,,	,,	3½	3½	Do. 3½ p.c. max. .	62—65	..	63½—64
62,235	,,	,,	4	4	Do. 4 p.c. Con. Pref. .	78—80	..	79—80
61,930	,,	Dec. 18	3	3	Do. 3 p.c. Con. Deb. .	59—62	..	60½—61½
30,000	,,	—	10	10	Do. 10 p.c. Bonds . .	..	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb. .	..	..	..
82,500	,,	Mar. 19	6½	6½	Hastings & St. L. 5 p.c. Conv.	92—97	..	95
58,740	,,	,,	5½	5½	Do. 5½ p.c. Conv. .	73—78	..	..
70,000	10	May 7	10	10	Houghton & China, Ltd. .	15⅞—16¼*	..	..
86,600	Stk.	Mar. 5	10	10	Hornsey 7 p.c.	136—141	..	..
76,000	,,	Nov. 20	30	10	Imperial Continental Cap..	180—185	+1	180—183½
63,950	,,	Feb. 5	3½	3½	Do. 3½ p.c. Red. Deb.	71—74	..	..
35,242	,,	Mar. 19	6½	6½	Lea Bridge 5 p.c. Ord.. .	96—101	..	..
27,340	,,	Feb. 19	5½	5½	Liverpool 5 p.c. Ord.. .	89½—90½	+½	90
00,000	,,	Mar. 19	7	7	Do. 7 p.c. Red. Pref.	103½—104½b	..	104¼
65,736	,,	Feb. 19	9	8	Maidstone 5 p.c. Cap. . .	122—132	..	..
63,480	,,	Dec. 18	3	3	Do. 3 p.c. Deb.. .	54—59	..	..
75,000	5	Dec. 4	7	5	Malta & Mediterranean .	4¼—4⅝	..	4⅛
41,920	Stk.	Nov. 20	4	4	Montevideo, Ltd.	64—69	+2	..
61,315	,,	Mar. 5	5	5	Newcastle & Gateshead Con.	77⅛—78d	..	..
00,929	,,	,,	4	4	Do. 4 p.c. Pref..	73—74d	+⅛	..
29,705	,,	Dec. 18	3½	3½	Do. 3½ p.c. Deb.	68½—69¼d	..	..
15,000	,,	Mar. 5	11	12	North Middlesex 10 p.c. .	..	..	..
75,940	,,	,,	7 7/10	8⅛	Do. 7 p.c. .	..	..	..
00,000	Stk.	May 7	9	7	Oriental, Ltd.	100—105*	..	..
88,120	,,	Jan. 8	7⅛	7⅛	Plym'th & Ston'house 5 p.c.	109—114	..	..
60,000	50	Mar. 5	13	14	Portsea Island B . . .	96—99	..	..
00,000	50	,,	12	13	Do. C	93—98	..	..
89,909	1	,,	—	—	Primitiva Ord.	9/—10/—	−/6	9/3—9/7½
11,100	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb. .	79—81	..	..
00,000	Stk.	Jan. 22	4	4	Do. 4 p.c. Red. Deb. 1911	64—66	+1	..
20,335	,,	Dec. 18	4	4	Do. B. Aires 4 p.c. Rd. Db.	65—67	..	..
21,670	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	65—67	..	..
50,000	10	Mar. 19	6	6	San Paulo 6 p.c. Pref. .	7⅞—8⅛	..	..
25,000	50	Jan. 2	5	5	Do. 5 p.c. Red. Deb.	43—46	..	..
70,000	Stk.	Mar. 19	5⅛	5⅛	Sheffield A	103—105e	..	..
19,968	,,	,,	5⅛	5⅛	Do. B	103—105e	..	..
47,000	,,	,,	5⅛	5⅛	Do. C	103—105e	..	..
90,000	10	Oct. 23	8	6	South African	7—9	..	..
09,895	Stk.	Feb. 19	5	6½	South Met. Ord.	93—95	..	93½—94½
93,445	,,	Jan. 8	3	3	Do. 3 p.c. Deb. . .	59—62	..	60½—61½
34,000	,,	Mar. 5	6½	6½	Do. 6½ p.c. Red. Deb.	102½—104½	..	103—103½
91,500	,,	Mar. 5	8½	8½	South Shields Con. . . .	135—136d	..	..
87,795	,,	Feb. 19	6½	6½	South Suburban Ord. 5 p.c.	97—102	..	..
68,837	,,	Dec. 18	5	5	Do. 5 p.c. Deb.	97—100	..	..
47,740	,,	May 7	5	5	South'mpt'n Ord. 5 p.c. max.	81—84*	..	..
21,475	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	72—77	..	74½—75
50,000	,,	Mar. 5	7	7	Swansea 7 p.c. Red. Pref. .	102—104	+½	..
00,000	,,	Dec. 18	6½	6½	Do. 6½ p.c. Red. Deb. .	103—105	..	..
20,000	,,	Feb. 19	8	8	Tottenham District A 5 p.c.	116—119	..	..
83,275	,,	,,	6½	6½	Do. B 5½ p.c. .	96—99	−1	97—98½
81,255	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	77—80	..	..
58,251	,,	Mar. 19	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, & Wycombe 5 p.c.. . .	77—79d	..	..
97,294	,,	Feb. 19	6½	6½	Do. 5 p.c. Pref. .	95—100	−5	..
88,330	,,	,,	5	5	Do. 5 p.c. Pref. .	95—100	..	..
91,800	,,	,,	—	6½	Do. 5 p.c. Maidenh'd	90—95	..	..
					Wandsworth, Wimbledon, and Epsom—			
90,000	,,	Mar. 5	9½	9½	Wandsworth A 5 p.c. .	130—135	..	..
55,636	,,	,,	7½	7½	Do. B 3½ p.c. .	110—115	..	..
92,955	,,	,,	6/9/6	6/9/6	Do. C and New .	95—100	..	..
52,000	,,	,,	7½	7½	Wimbledon 5 p.c. . .	105—110	..	..
98,000	,,	,,	7⅛	7⅛	Epsom 5 p.c.. . . .	112—117	−3	..
88,416	,,	Dec. 18	3	3	3 p.c. Deb.	57—60	..	58—58½

Quotations at :—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. * Ex. div.

The Gas Market was very active. The transactions were above the normal. Although there were several important falls in the quotations, notably Uxbridge Maidenhead and Wycombe, which dropped 5 points to 95-100, and Wandsworth (Epsom) 5 p.ct. stock 3 points to 112-117, it will be seen there were several upward markings. Among the recent capital issues were: Watford Gas, £50,000 "B" Capital Stock by tender, minimum par; Guildford Gas, £20,000 5 p.ct. Preference—minimum 90; York Town and Blackwater Gas, £10,000 5½ p.ct. Perpetual Debenture at par; and Southend Gas, £50,000 5½ p.ct. Irredeemable Preference, minimum par.

The following transactions were recorded during the week :

On Monday, Bahia Blanca "A" 2s. 7¾d., 2s. 9d., Bombay 5 *ex* div., Bournemouth "B" 12⅞, 12$\frac{11}{16}$, Brentford "B" 96, Brighton and Hove "A" 124½, 125, British Gas Light 7 p.ct. preference 124, Croydon maximum dividend 84, European 7, Gas Light and Coke 83½, 83⅝, 83⅞, 84, 84½, 3½ p.ct. maximum 63½, Imperial Continental 181, Primitiva 9s. 6d., South Metropolitan 93¾.

On Tuesday, Cape Town 4½ p.ct. preference 6, Gas Light and Coke 83, 83⅛, 83½, 83¼, 83⅜, 84, 4 p.ct. preference 80, 3 p.ct. debenture 60¾, Hastings and St. Leonards 5 p.ct. converted 95, Imperial Continental 181, Liverpool 7 p.ct preference 104⅜, South Metropolitan 93½, 93⅝, 94, 3 p.ct. debenture 60⅜, 61⅜, 6½ p.ct. debenture 103½, Southampton 4 p.ct. debenture 74½, 75, Tottenham "B" 98, 98½, Wandsworth 3 p.ct. debenture 58⅝. Supplementary prices, Barnet "B" 147, "D" Water stock 107½, Redhill 7½ p.ct. 102½.

On Wednesday, Brentford "A" 97, 5 p.ct. preference 95, 4 p.ct. debenture 77½, European 7, 7⅛, Gas Light and Coke 83, 83¼, 83⅛, 83⅜, 3½ p.ct. maximum 63½, 64, 3 p.ct. debenture 60½, Imperial Continental 181, South Metropolitan 93⅜, 94, 94⅛, 6½ p.ct. debenture 103, Tottenham "B" 97. Supplementary prices, Cape Town 5 p.ct. regd. mortgage debentures 74, 74½, Cheltenham 5 p.ct. maximum 79, 79½.

On Thursday, Bournemouth 4 p.ct. debenture 79, Brentford "B" 96, Continental Union 37, European 7⅛, Gas Light and Coke 83, 83⅛, 83⅜, 4 p.ct. preference 80, 3 p.ct. debenture 61¼, Imperial Continental 180, 183, 184, Malta and Mediterranean 9⅛. 3d., Primitiva 9s. 3d., 9s. 4½d., 9s. 7¼d., South Metropolitan 94, 94⅛, 3 p.ct. debenture 61¼, Wandsworth 3 p.ct. debenture 58. Supplementary prices, Cheltenham 4 p.ct. debenture 62, 62½, Tottenham 5½ p.ct. preference 104¼, 104½.

On Friday, Brentford 4 p.ct. debenture 79½, Croydon maximum dividend 83, 83½, Gas Light and Coke 83⅛, 83¼, 83⅝, 83⅜, 3¼ p.ct. maximum 63½, 4 p.ct. preference 79, 79¾, Imperial Continental 182, 183½, Primitiva 9s. 3d., 9s. 6d., South Metropolitan 93½, 93⅝, 93⅜, 94, 94⅛, 3 p.ct. debenture 60⅝. Supplementary prices, Petersfield and Selsey 26s., 5 p.ct. preference 46s. 3d., 47s. 6d., Sutton 105.

In Lombard Street the chief interest was the Bank's purchase of £1,610,000 bar gold which played a definite part in easing the short loan market at the close of the week. Several dividend payments also assisted to this end, loans being obtainable at as low a rate as 3 p.ct. Treasury Bills for £28,000,000 were allotted at an average rate of £4 13s. 5·56d. p.ct., being nearly 3s. advance on the previous week's rate.

On the Foreign Exchange Market there was a good demand for sterling-dollars, and the rate closed at 4.85½. French francs were cheaper at 93.40, and Belgian francs at 96.35. Italian lire closed at 118.80.

Bar silver was fixed at $\frac{1}{16}$d. higher for forward delivery, the cash price being 31$\frac{3}{16}$d. Orders were received from both India and China.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on March 5. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3¼ p.ct. at notice.

TRADE NOTES.

Messrs. T. C. Jones & Co., Ltd.

This firm have just published a new hand and machine tool catalogue, which is fairly representative of the requirements of general engineers and contractors. The stock of lathes, and milling, shaping, drilling, and shearing machines is constantly being added to by the firm, and delivery of all types from stock can usually be had.

Dehydrating Plant and Tar Works Equipment.

A new catalogue has just been issued by Messrs. W. C. Holmes & Co., Ltd., in which they describe their latest plants for the distillation of coal tar by means of steam heated and fire heated continuously operated stills. The application of the Winker system to this process, in conjunction with the Hird still, or, indeed, any other type, is of interest to engineers and gas authorities already dehydrating or distilling their own tar; for, by adding a still of this type, a considerable increase in the capacity of an existing installation can be secured. The theoretical considerations involved are fully explained in the booklet.

York Town and Blackwater Debenture Issue.—Tenders for £10,000 of 5½ p.ct. perpetual debenture stock of the York Town and Blackwater Gas Company, which was offered by Messrs. A. & W. Richards, amounted to £24,400, and ranged from £105 down to the minimum of par.

South Suburban Gas Company's Standard Price.—The Public Control Committee of the London County Council have still under consideration the question of the action to be taken with a view to securing a revision of the standard price applicable to the South Suburban Gas Company.

CONTRACTS OPEN.

Coal.

Tenders are invited by the Slough Gas and Coke Company for the supply of 6000 tons of best screened gas coal. [See advert. on p. 547.]

The Directors of the Gloucester Gas Light Company are inviting tenders for the supply of about 30,000 tons of screened gas coal. [See advert. on p. 547.]

The Gas Committee of the County Borough of Stoke-on-Trent are inviting tenders for the supply of 93,500 tons of gas coal and 13 tons of steam slack. [See advert. on p. 547.]

Lea Bridge Preference Stock Issue.—Particulars will be found in our advertisement pages to-day of an issue by Messrs. A. & W. Richards, of No. 37, Walbrook, E.C., of £30,000 of 6 p.ct. irredeemable preference stock in the Lea Bridge District Gas Company. The new capital is required to meet the outlay on extensions of the works, mains, &c., rendered necessary by the constantly increasing demands for gas.

Gas Price at Burnley.—Explaining to the Burnley Town Council the Gas Committee's decision to increase the price of gas 1d. per therm, Alderman H. Emmott (the Chairman) stated that it would only cover half the estimated loss of £12,200. The balance would be taken from the reserve fund. The reasons for the loss were the estimated drop of £5000 in coke as compared with the previous year and £4700 in tar, with the payment of £5000 more in wages.

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'OL. CLXX., No. 3237.] WEDNESDAY, MAY 27, 1925. [77TH YEAR.

EDITORIAL NOTES.

Pricking the Bubbles.

E bubbles by which the Government electricity develop-nt ideas are being supported have been pricked in a ·st effective manner by the President of the Society of itish Gas Industries (Mr. D. Milne Watson, Governor the Gas Light and Coke Company, and President of : National Gas Council). He performed this task in Presidential Address which he delivered to the Society t Wednesday. Whether he has caused the bubbles to rst loudly enough to impress the Government cannot said; but at any rate they cannot ignore the utter-ces of one who officially stands at the head of the ganizations of the gas industry, and is the Governor the largest gas undertaking in the world. It was a sterly, analytical, and statesmanlike deliverance; and a criticism of the movement which is being politically gineered to render State-aid to the electricity industry probably both in money and legislative influence—thing has hitherto been done to equal it, nor have we seen any speech that has been made by any political der in support of preferential legislative treatment of ctricity which has shown a tithe of cogency construc-ely that this address presents destructively. The point, wever, should be made clear that the gas industry does t want to stand in the way of any legitimate develop-ent of the electricity industry. But it does object to usual facilities being granted to that industry to aid development on pseudo-national grounds, which have en adopted politically through misconception and mis-ding, and which, while not improving matters nation-y, would act detrimentally upon an industry doing ually important national work, though unrecognized the powers-that-be who have been captured by the *parte* evidence of those electrically concerned. The uble is that the final determination of this matter rests the hands of politicians whom the Right Hon. r Alfred Mond (the new President of the Society of itish Gas Industries) describes as "ignorant men on chnical matters." We will not admit that the descrip-n entirely applies; but it does in the main to those who ve been the loudest and most persistent among the ad-cates of the State taking electricity specially under its ng. And these are the people who (as Sir Alfred puts talk gaily about super-power stations, but who do t know the difference between a volt and an ampère, d who have never seen a dynamo. The critical address is come very opportunely; and it has been decided to rry out a suggestion of the new President to send a copy it to the Prime Minister, the Minister of Transport, r. Lloyd George, Mr. Snowden, and other members of rliament. Well-placed copies in municipal councils uld also do good.

The whole matter, as Sir Arthur Duckham says, is of tal importance not only to the gas industry, but to the tion at large. It is so because the problem involved is been considered only from the point of view of an dustry which in its very best practice shows an inefficiency of 80 p.ct., while consideration should have been given to the whole problem of the utilization of our fuel resources for the provision of power and heat. That is where a fundamental error has been made. At the present time, one does not know anything positive as to the character of the report that has been made to the Government by Lord Weir's Committee, or as to its recommendations. It would appear almost as though the report contains features that were unexpected by the Government. It was anticipated that a statement on their policy in the matter would have been made in the House last Thursday; but Lieut.-Col. Ashley, Minister of Transport, stated that the draft of the report was only received the previous Friday, and the complete report on Wednesday. He could not even say whether or not the report would be published. If it is not, it will seem very much as though there is something in it that the Government wish to hide. Being a national question, the nation have a right to be informed of all that there is to be known regarding it. Should, therefore, the Government not voluntarily publish the report, they should be pressed to do so until they yield, so that it may be discussed not only from those points of view that are convenient politically, but from those that are economically and technically important. However, whatever is in the report, the credulity of certain members of the Government will probably remain undisturbed. When speaking last Thursday, the Minister of Transport stated that, if the Government approached this matter from the national point of view, they could "hammer out" a scheme which would give a cheap and general supply of electricity. He added that, if this were done, he felt sure they would present to this country a weapon whereby it would be able more effectively to deal with foreign competition. The mischief of this sort of political scheming and talk is that we do not suppose Lieut.-Col. Ashley has a ghost of a notion of the extent to which any accruing difference in the cost of power would affect the competitive position. If he ascertained what proportion of works cost in any process of manufacture the item for power represents, we are sure he would not talk at random in the manner he does on this question. Neither do we believe he has any idea that the best practice of electricity shows only 20 p.ct. efficiency, and that under the national scheme it may easily be that more will be lost in distribution than is gained through another modicum of economy being derived from the fuel costs of electricity generation. How this is going to assist in putting this country in a better position competitively is a complete mystery; the chances are equally great that it will worsen our position in that respect, and weaken our internal security.

That the gas industry is entitled to the consideration of the Government when dealing with the question of the provision of power and (as they should be doing) heat, is clearly shown by some remarkable data presented by Mr. Milne Watson in his address. In Great Britain, the consumption of gas amounts to 275,000 million c.ft. annually, which is equal approximately to 1320 million therms. Taking the population at 47,350,000, the consumption of gas works out to 28 therms per head. The amount of electrical energy required to do the work actu-

ally performed by this quantity of gas, in its varied uses by the public, is calculated by the President at 487 KW.H., while the consumption of electricity in the country is only 139 units *per capita*. In the computation which brings out the equivalent figure of 487 KW.H., the President has been characteristically generous to electricity in the matter of efficiency in use. The figures should cause the Government to pause, and inquire into the actual reasons for their existence. Again, if the Government feel any responsibility in regard to the question of the conservation of our national fuel resources—before moving in the matter of promoting, on false premises, conditions to aid the development of the electricity industry other than by its own exertions and natural growth—they should take into account the position of the two industries in respect of the efficiency of the use of coal. It would be nothing less than a scandal that State funds should be employed to foster the inefficient use of coal, and so encourage waste of our resources. The address should make it quite clear to the Government and to members of Parliament generally that the problem of power and heat supplies in this country is being attacked from the wrong end. Furthermore, as Mr. Milne Watson points out, the grant of subsidies for the development of industries (particularly sheltered ones) is wrong in principle; and, inasmuch as the gas industry has paid for its own development, and occupies such a prominent place in the system and service of the country, it has a right to be heard on this matter, and to be furnished with the exact grounds on which the Government base their case for giving preferential consideration to a competing industry. The title of the industry to this information, and to be heard respecting any case that can be put forward, is accentuated by the fact that as a tax and rate payer it is an enormous contributor to national and local finances. If at all possible, therefore, the fullest satisfaction should be given by the Government that their proposals are right, and not economically and technically wrong. Anyway, if they will not pursue these suggested and just courses, then, if there is insistence by Parliament on subsidies being given to electricity, the claim of Mr. Milne Watson should be honoured, that subsidies should only be granted by way of loans, and in fairness to other industries loans should be allowed to them on like terms. But it would be much better that there should be no subsidies. As a matter of fact, the electrical industry is not in need of capital; and the dividends paid (far in excess of the controlled ones in the gas industry) show the ability of the industry to attract all the capital it requires.

The idea that this development of electricity will materially assist industry is proved by the address to be purely hypothetical, as witness the happenings on the north-east coast; and so is the idea that it will in any way improve employment. If by the aid of the public purse (to which the gas industry so heavily subscribes) electricity is cheapened for power purposes, and the ideas of the Government mature as to the lowering of the costs of industrial production (which we very much doubt), would it not follow that industry would prefer to adopt more extensively mechanical means in place of manual labour? The Labour Party have all through the piece been profoundly blind in this matter; and they have not even been aware of a fact which is put forward in the President's Address, and which should arrest their attention. It is that the gas industry employs more than five men for every one that electricity employs for the same amount of heat energy. The industry which labour should assist in developing is the one that offers the larger field for employment. But nationalization is in view; and the electricity industry appears to be an easy victim. To secure it—to satisfy a meretricious item of policy—is something, in the view of the Labour leaders, that is worthier of fervent work and blatant advocacy than the cause of employment. Electricity is not the solution of the unemployment problem; to say that it is, is nothing more than a political stunt and gross deception.

The members of the Society of British Gas Industries are as deeply concerned in this matter as the gas-supply industry; and they are as grateful to their President for his brilliant examination of the position and exposure of claims as will be those who have the responsibility upon them of guarding the interests of gas supply.

The Miners' Enlightenment.

Out of the bad conditions in the mining industry go may come in the enlightenment of the miners as to t destructive effects of the bad policy of the extremists the past. The miners have been blindly following the leaders; and it is a shock to them to find that it has l them to a position at which this country cannot in r spect of coal successfully compete with other countrie Thus sales have seriously diminished, prices have had fall, profits for many of the old pits are negligible non-existent, some 160,000 miners are out of work, ma thousands are on short time, and the number increas daily. Why? Largely because of the reduction of t output of coal per shift, and therefore the much high cost of wages per ton. And the item of wages, being th greatest in the total cost, is the one which has the heavie effect in preventing competition with other countri where the conditions are the reverse—where there greater production per man shift, and thus a lower co for wages per ton. The position will not be altered wit out the miners themselves move. Large sections are st showing resistance. But knowledge is growing that t men have been led by the noses into the present mess b the ultraists among their leaders. It was bound to com and come it has with disastrous effects upon the mine themselves. Many of them are now realizing that t flouting of economic conditions cannot be carried on i definitely; but in the end there will be a rebound, to t injury of those who have been fools enough to think th they are omnipotent in such matters. Hence the numb of miners is increasing who desire to see a retracing steps to saner conditions, and who are willing to help bring them about. But those conditions would nev have grown so severe had it not been for those wil brained individuals who thought they could effect perm nent good by supplanting order by disorder. Instead improving the miners' conditions, they have worsen them; and even now are trying to save their faces b urging them immediately to give notice to terminate t national agreement, and to present a new proposal f wages. They have still a good following; but, fort nately, not one which can do harm, as was seen last we at the Blackpool special delegate conference when t proposal of the Executive of the Miners' Federation, th the Joint Committee of owners' and miners' represent tives should continue their investigations into the con tions of the industry, was agreed to by 571,000 to 230,0 votes—although an amendment had been moved to t effect that new wage proposals should be drafted.

That vote shows the way the wind is blowing amo the men. Last week we referred to other indication fresh ones have been made during the interval. One the principal of these was a letter in "The Times" Mr. James Meadows, Financial Member, South Wal Miners' Federation, Rhondda Main Lodge. It was letter which acknowledged that the policy of the p had been wrong, which made no secret of the evil r sults, and which suggested a line of policy that wou promote relief from the present situation. Mr. Meadow showed the serious amount of unemployment and part employment existing among the South Wales miner and then he said: "We miners here, in common wi those in other exporting districts (though not to the sar extent as we have), have been living in a fool's paradi since 1916 or 1917. Those were the days of ca' cann and from the fruit of that evil policy we are to-day suffe ing." He sketched the appalling condition of wives a children; and then he said that the duty of the delegat conference was to present proposals which would arre the slump, and so give our export coal a chance in t markets of the world. Whether this suggestion was co sidered at the conference is not stated in the meagre new paper reports. The views of this sapient leader are th forthwith there should be a reduction of the price of co by 4s. Labour costs, he asserts, could be eased by per ton; and the railway authorities, as in German should allow 1s. per ton off the carriage of all export coal. That in his judgment is the solution, and the ro by which prosperity will again come back to the mini industry. In our opinion, and in that of a good ma fully competent judges, he is right. We like the spirit the letter; also the strength of will which (if supporte

ould send the extremists and their destructive policy to her business than that of misleading the miners. Says r. Meadows: "We miners can do it. We can reduce bour costs by 3s. per ton; and we will do so before we ill see our vital industry perish. Even Mr. Cook can- ot stop us. There is a determination in South Wales nyhow to get away from crippling the mining industry, nd to assist it to get on its feet and find work for the o,000 partially unemployed and the 50,000 totally un- nployed." Unless this is done, he sees further misery r the men, their wives, and children. Mr. Frank Hall, ie Derbyshire miners' leader, has advised the men to t tight, and abide by the conditions of the moment, as e is not foolish enough to say this is an opportune time o end the agreement. He states that throughout the ining areas there are 160,000 miners without work; nd there is no single union which could stand a strike r any length of time. As to amalgamation with the ailway and transport men, Mr. Hall says there are housands of railway men unemployed, and the transport orkers are split up into forty or fifty unions. There oes not seem much chance of cohesion in those circum- tances. But the agitator Cook only last Saturday, in ddressing the West Auckland miners, expressed the iew that the miners' conditions justified a strike. But he s not silly enough to think they can fight alone; and so e devoutly hopes the engineering, railway, and transport orkers will on June 4 decide on a "practical brother- ood," thus helping the miners to secure relief from the resent mess into which he and others have brought them. But he wants the relief to come by his own route, and not y that which better balanced minds know is the only ane and safe one. The methods of the wild men would nly precipitate the miners into a state of greater chaos nd immeasurable misery.

Specifying and Inspecting Piping on Consumers' Premises.

To inspect, adjust, and maintain gas-consuming appli- nces (excepting the provision of materials) is only one art of the service which should be rendered by gas under- akings, in order to ensure efficient use on consumers' remises. That is a matter vital to business maintenance nd progress in these days when the severity of compe- ition is growing and is being preferentially assisted by political benevolence. That work, however, should be complementary to something else. Supervision by the suppliers of gas, who are the most competent and in- terested people, should extend to the efficient piping of new buildings, with power to condemn old piping which has reached a dangerous state or is no longer capable, through insufficient carrying capacity, to meet require- ments. Authority in the latter respect is highly desirable, because the greater proportion of houses were piped when there was no thought of gas becoming the popular heating agent that it is to-day. But there is no use what- ever in being able to condemn if there is no accompany- ing authority to refuse to supply appliances beyond the capability of the piping to render service. That seems to be a defect in the specification authorization which has so far been statutorily granted. There may be refusal to supply if new or renewal piping is not according to speci- fication; but nothing is said as to cases of insufficiency or defects on old premises. That is where much inca- pacity resides, and where revision or renewal is much needed. Power to specify and ensure that new premises are properly equipped will, of course, prevent architects and builders putting-in, for economic reasons, piping that cannot fully meet the probable ultimate requirements of the tenants.

As already indicated, several undertakings have to-day statutory power to specify piping; and no undertaking which has that power would be without the assurance it gives of keeping things right for the future. Among the suppliers who have the power are the Halifax Cor- poration; and Mr. W. B. M'Lusky, the Engineer and Manager of the Department, introduced a discussion on the subject at the meeting last Friday of the Manchester District Institution of Gas Engineers. It will be seen from the report in other columns that the sections of the Halifax Corporation Act of 1920 are quoted which confer the power to specify, inspect, and test new, renewal, or extension piping on any premises. It will also be noticed that different specifications may be made for different classes of premises. If the Corporation find that there is not compliance with their specification, and refuse to supply until there is rectification, the occupier of the premises has the right to appeal to a petty sessional court; but there would be little hope of success if avoid- able departures from the specification could be proved. The Halifax specification is given *in extenso*. It ap- pears to be comprehensive, contains much useful infor- mation, and will be of value to others in entering upon this work, though it may not square in every detail with the present or prospective prescriptions of others. In the specification is noticed the provision that where gas and electricity supplies are being used on the same premises, the gas-pipes must not be fixed at a less distance than a foot from the electric wires. This reference to the subject is merely to direct attention to it and its importance; and to ensure consideration of the views of those who took part in the discussion at the meeting.

Institution Visits.

All the arrangements in connection with the annual meeting of the Institution of Gas Engineers, to be held under the presidency of Mr. J. Ferguson Bell, M.Inst.C.E., of Derby, are shaping splendidly. As to the visits, upwards of 250 members will be going to the Fulham Station of the Gas Light and Coke Company, to view the new Glover-West vertical retort installation now under construction. Simultaneously about 100 will visit the National Physical Laboratory; and about another 100 will inspect the Laboratories, &c., of the South Metropolitan Gas Company. In the visit to Derby, about 400 will be participating.

Praise for the Gas Exhibit.

To "The Times" Empire Day Number, Sir Lawrence Weaver, Director of United Kingdom Exhibits, contributed an article. Praise from the author of the exquisite volume "Exhibitions and the Arts of Display" is something of which to be proud. In the article, Sir Lawrence, writing of the Palace of Industry, remarks: "The British Empire Gas Exhibit stages once more its manifold public and domestic services in a changed setting of great architectural dignity, and has absorbed a large adjoining area in association with the Empire Food Demonstration Committee. Women visitors rejoiced in the gas show in 1924; they will with difficulty be lured out of its halls this year."

Ventilate the Bath Room.

A correspondent suggests that it would be a good thing, even where gas geysers are properly fitted, if users would turn-off the gas to the geyser and properly ventilate the room before using the bath. This would certainly obviate any danger. In his letter, our friend says: "There are still far too many acci- dents with geysers, which could be avoided if the user would always turn-off the gas to the geyser and ventilate the room, before having a bath. In no circumstances should the geyser be in operation while a bath is being taken. Every geyser should, of course, be fitted with a baffle, and a vent-pipe taken through to the open air and discharging above the eaves of the roof; but even when these precautions are taken, there is always a risk of down-draught under certain atmospheric conditions. It really amounts to this, that no one can fix a geyser, and say that under all conditions of atmosphere the flue will properly function." In the case of his Company, a card is issued with every geyser, with a suggestion that it should be hung in a prominent position in the bath room. The card bears, in bold lettering, this advice: "Before using Bath, Turn off Geyser Taps, and Well Ventilate Room." The Company have offered to supply the ironmongers and fitters in the dis- trict, on trade terms, with the necessary flue fittings for geysers, and with as many of the cards referred to as they desire, free of cost. Other undertakings may see fit to follow this good example.

Still Busy.

The revelations at the Barford inquiry as to the operations of the company promoting group at 43, Cannon Street (upon which comment was made in our issue for May 13, p. 445), have not deterred these gentry from raking-up some of their old prospectuses, and sending them out for the purpose of getting in more money. Further copies of the one which offers additional extension capital in the Chagford and Devon Electric Light Company, Ltd., have been received, and so have copies of that precious document referring to the Southern Counties Electric Light and Power Supply, Ltd. On the former the name of Eaton appears; on both are the names of the baronet Soame, Thompson, the Solicitor, and Turner & Co., the Auditors. Criticism of both these prospectuses has appeared in our columns.

Coal Exports.

The uneasiness over the position of the coal export trade is shown by the April returns to be fully justified. The total amount of coal exported in the month was 4,359,817 tons, as compared with 5,062,941 tons in April, 1924, and 6,841,423 tons in April, 1923. The value of the exports this April was only about half that for the same month of 1923—viz., £4,541,333, as compared with £8,914,748. The value for 1924 came about midway between the two—£6,326,197. The gas coal shipped last month accounted for 565,247 tons of the total quantity, compared with 691,449 tons in April, 1924, and 728,353 tons in April, 1923. The values were: Last month, £554,131; April, 1924, £837,902; April, 1923, £902,276. The average value per ton for gas coal last month fell below £1, or 19s. 7·28d. In the four months the total amount of coal of all kinds sent abroad totalled to 17,462,134 tons, compared with 20,768,891 tons in the corresponding period of 1924, and 25,535,825 tons in that of 1923. Of these quantities, gas coal represented respectively 2,286,093 tons, 2,673,295 tons, and 3,019,143 tons; the values attached being £2,314,933, £3,239,696, and £3,536,135.

Export Coke Doing Badly.

The export coke market is extremely unsatisfactory. In April, only 25,599 tons were shipped, as against 43,021 tons in April, 1924, and 87,885 tons in April, 1923. The values of these quantities were respectively £30,902, £76,509, and £138,043. In the corresponding four months of the three years, the quantities exported were: This year, 183,777 tons; 1924, 369,476 tons; and 1923, 382,438 tons. The values of these shipments were: This year, £270,987; 1924, £645,870; 1923, £566,984. The average value for April was only £1 4s. 1·75d., as against an average of £1 9s. 6d. for the first four months. In April last year, the average value was £1 15s. 6·8d—better than last month by 11s. 5d.

Sulphate of Ammonia.

Business in sulphate of ammonia abroad distinctly looked up last month. The quantity exported was 19,445 tons, as compared with 12,148 tons in April, 1924. In the four months, 99,052 tons were shipped, as against 99,406 tons in the same period of last year, which is close showing. Spain and the Canaries were good customers in the month, with 11,296 tons; and their total purchases during the four months have amounted to 39,995 tons. Japan comes next in the four months with 17,082 tons, and Dutch East Indies follows with 15,167 tons.

Coal Tar Products.

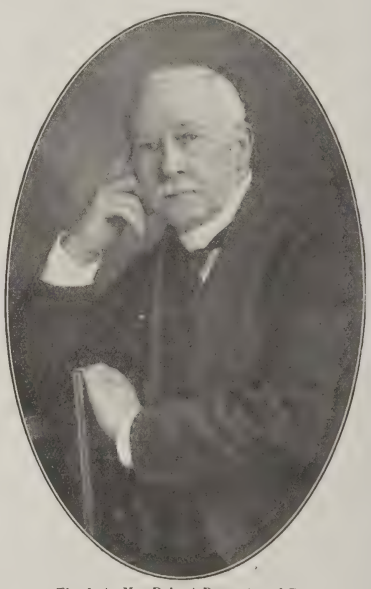
The amount of benzole exported during April was 19,588 gallons, as compared with 10,545 gallons in April, 1924. The quantity shipped in the four months of the year was 135,109 gallons, as against 263,294 gallons. Of naphtha only 4331 gallons were exported in April, compared with 50,206 gallons in April, 1924. In the four months, 15,226 gallons were shipped, which is small in comparison with the 100,003 gallons in the first four months of 1924. Combining the exports of tar, oil, creosote, &c., 1,115,066 gallons were sent abroad last month, as against 1,999,073 gallons in April, 1924. In the four months, 11,944,012 gallons were shipped, as compared with 11,512,821 gallons in the same period of 1924.

OBITUARY.

ROBERT DEMPSTER.

It is with great regret that we announce the death at Cape Town of Mr. Robert Dempster, J.P., of Vale Royal, Cheshire. Mr. Dempster was the Senior Member of Messrs R. & J. Dempster, Ltd., of Gas Plant Works, Manchester. He was born at Dundee on Feb. 16, 1853, and was the eldest son of the late Robert Dempster, of Elland and Penmaenmawr. Of late years the deceased had not been as prominent in our public life as in years gone by, when, with Mrs. Dempster, he was a regular visitor to our annual meetings. He, however, never lost touch with the industry in which he had for so many years taken such an active part, and regularly attended Directors' meetings at Manchester. He was also a Director of several Iron and Chemical Companies.

Mr. Dempster was always a great traveller. Many years ago he made a world tour, and visited numerous foreign gasworks. Although during last year his health was very unsatisfactory, he was of the opinion that a sea voyage to South Africa would be beneficial. A post-card received on the day of his death, posted at Victoria Falls, stated how well he was feeling, and that he proposed to travel through to Cape Town (a distance of 1700 miles), with only one stop for rest. Until further news is received, we can only surmise that the effects of this long train journey proved too much for him; for his death occurred there on May 17.



The Late Mr. Robert Dempster, J.P.

Mrs. Dempster predeceased her husband; and the deceased leaves two daughters, Mrs. W. F. Perkins and Miss Edith Dempster, J.P. The latter was accompanying her father on what has proved to be his last journey.

Mr. Dempster for many years has resided at Vale Royal. Only recently he excavated the remains of a Cistercian Abbey, accounts of which have already appeared. His mind was always receptive to improvements in machinery; and the splendidly equipped works at Manchester are largely due to his organization—he being always on the *qui vive* for new ideas in this direction. His wide knowledge of men, and love of travel, enabled him to view the things of to-day with a broad outlook, which made him a most agreeable companion. Strange to say, when he left England he was due to return on the s.s. "Windsor Castle," which boat is bringing the body, to be buried at Whitegate Church, Cheshire.

Dr. Davidson's Claim on the War Office.—We understand that the Royal Commission on Awards to Inventors who considered the application of Dr. W. B. Davidson in respect of a process for the extraction of toluole from coal gas (see *ante*, pp. 322, 381) have recommended to the Treasury that £350 should be paid to Dr. Davidson as remuneration in respect of all uses, past, present, and future, by the Crown of his process. Sums expended by Dr. Davidson in producing and testing the process were considered in arriving at the award stated.

PERSONAL.

Mr. J. H. Canning, Engineer and Manager of the Newport (Mon.) Gas Company, is the new President of the Rotary Club of Newport.

We have pleasure in announcing that Mr F. G. Brockway, son of the late Mr. E. J. Brockway, J.P., of Cleethorpes, has been appointed Manager and Secretary of the Cleethorpes Gas Company in succession to his father.

The marriage took place at Southampton, on May 23, of Mr. Frank Henry James, Secretary of the Imperial Continental Gas Association, to Mary Margaret, younger daughter of Mr. and Mrs. Charles Fox, of Merrietrees, Ambridge, near Romsey.

Upon completing 25 years as Secretary to the Cannock, Hednesford, and District Gas Company, Ltd., Mr. T. A. Nicholls has been presented by the Directors with a grandfather clock, with Westminster chimes, as a mark of appreciation of his services.

Mention was made in the "Journal" for May 13 of the forthcoming retirement of Mr. W. S. Haddock from the position of Gas Engineer and Manager to the Warrington Corporation. Born in Warrington, Mr. Haddock was in 1877 apprenticed to Mr. James Paterson, who was at that time Engineer of the gas-works, which had just been acquired by the Corporation from the Gas Company. Later he became deputy to Mr. Paterson, and was appointed Manager in July, 1888. In 1888-89, the quantity of gas sold and accounted for was 178¾ million c.ft., while in the year just ended (1924-5) it was about 534 millions, or rather more than the figure for 1914-15. The price in 1888-89 was 3s. per 1000 c.ft., and in 1923-24 2s. 10d.; a figure of 2s. 1d. having prevailed for a number of years in the interval. Woodall-Duckham vertical retorts were erected in 1922. The net profit made during Mr. Haddock's management, up to the end of 1924, was £223,000.

Mr. Albert Cook, who will take up the duties of Gas Engineer and Manager to the Warrington Corporation as from July 1, was in 1910 articled to the late Mr. T. O. Paterson, then Engineer and Manager to the Birkenhead Corporation Gas Department. On completion of his articles, Mr. Cook was appointed Assistant Clerk of Works, and later Assistant Works Superintendent. During the five years he spent at Birkenhead extensive alterations were carried out, including a spiral-guided holder of 2½ million c.ft. capacity, a 2½ million installation of vertical retorts on the Woodall-Duckham system, a large power house, exhauster house, residual wells, new carburetted water gas plant, showrooms, high-pressure mains, &c. For three years to the end of 1918 he was Assistant Works Superintendent to the Wolverhampton Gas Company; and then he went to Warrington, first as Works Superintendent, afterwards to become Chief Assistant Engineer and Manager.

FORTHCOMING ENGAGEMENTS.

May 29.—Chemical Engineering Group of the Society of Chemical Industry.

Sixth annual general meeting at the Chemical Industry Club at 8.15. Mr. C. S. Garland, B.Sc., A.R.C.Sc., F.I.C., Chairman of the Group, will preside. The meeting will be preceded by an informal dinner in the Club at seven o'clock.

June 5.—Southern Association of Gas Engineers.

Visit to the works of the Bournemouth Gas and Water Company.

June 6.—Scottish Jr. Gas Association (Eastern District).

Annual outing at Anstruther.

June 8.—Institution of Gas Engineers.

Council meeting at No. 28, Grosvenor Gardens, at 2.15.

June 8.—Evening Star Lodge.

Regular meeting, at 5 p.m., in the Grand Temple of the Freemason's Hall, Great Queen Street, London.

June 9-11.—Institution of Gas Engineers.

Annual general meeting in the Great Hall of the Institution of Civil Engineers, Great George Street, Westminster. At the termination of Thursday's meeting, a Council meeting will be held at the Institution of Civil Engineers.

June 10.—Association of Statutory Inspectors of Gas Meters.

Annual general meeting at the new County Hall, Westminster. The afternoon will be devoted to a visit to the Finsbury gas meter testing office.

June 11.—Coke Oven Managers' Association (Midland Section).

Visit to the Barugh plant of Low-Temperature Carbonisation, Ltd.

June 12.—Institution of Gas Engineers.

Visit to Derby. Members should note that the luncheon will be in the Drill Hall, Derby—*not* the Assembly Rooms, as indicated in the programme.

June 20.—London and Southern District Junior Gas Association.

Visit to the Cambridge Gas-Works.

ELECTRICITY SUPPLY MEMORANDA.

Poplar has done many queer things in its time, and owing to a propensity for throwing away the money of the ratepayers without getting a fair return for it, the Council have got into serious hot water. They have now taken to heating water by electricity for the public baths. From the point of view of those who control these, the transaction is regarded as all right. From the point of view of the electricity undertaking, it cannot be so described; from the national point of view, it is a disgraceful waste of fuel. "Meteor" of the "Electrical Times" says: "Our friends the gas men always assume the electric heating of water to be an impudent stunt." It is. "They regard it as particularly preposterous where large bodies of water are in question." It is. "We put it to them, however, that it is cheaper than gas for heating public baths on a large scale." It is not. "Poplar," we also read, "has thrown out its gas heating at the baths because it is too expensive; it has replaced gas by electric heating, because the latter is cheaper." The comparison is made with gas at 3s. 9¾d. per 1000 c.ft., or 9·15d. per therm, which includes all costs, even the capital charges, while electricity is taken at the bare fuel costs, or a little over—so little that calculation hardly enables its detection. No other generating costs are included; and nothing for distribution, capital, or other charges. The current has to be taken at off-peak load times—between 5 p.m. and 8 a.m., after 1 p.m. on Saturdays, and between noon and 2 p.m. every day. At such times, the generating plant is not working at its best efficiency, so that the fuel costs then would be somewhat greater than the average figure. Those conditions—particularly the difference between what is comprised in the charge for gas and that for electricity—"Meteor" considers are things which can be ignored, and, by ignoring them, he feels justified in saying that electricity is "cheaper" for the purpose of water heating. It would be cheaper still if the "real live" Electrical Engineer of Poplar decided to rule-out the fuel costs, as he has done everything else in supplying energy to the public baths. Notwithstanding gas being supplied on a commercial basis and electricity not, "Meteor" says that the cost for electrical energy actually works out at 2·33d. per bath; for gas it averaged 2·23d. per bath. Now if the Gas Company had been such asses as to have supplied gaseous energy at bare net fuel cost, can "Meteor" guess where electricity would have been in the comparison? We are also wondering whether he knows what it means "to play the game."

Poplar Washes and Wastes.

In view of the foregoing, it seems absurd to follow-up this Poplar public baths heating scheme; but we confess to being interested in the data attaching to it, which are found in a paper that Mr. Jefferson Hope, the Baths Superintendent at Poplar, read at the annual conference of Baths Superintendents in Leeds. He takes the average slipper bath as requiring 30 gallons of water at 110°. Assuming the temperature of the inlet water to the heater is 50°, the 30 gallons would require (without any stand-by and other heat losses) 18,000 B.Th.U. to raise the temperature to 110°, or 5·26 units. Naturally, with the heat losses, more energy would be needed than that. A swimming-bath containing 80,000 gallons of water raised in temperature from 50° to 74° would require 19,200,000 B.Th.U., which again takes no account of heat losses, or of heat to maintain the temperature at 74°. Mr. Hope takes the calorific value of the coal used for the boilers at 12,000 B.Th.U. per lb., which is equivalent to 26,880,000 B.Th.U. per ton. We have not the generating figures for Poplar; but we will adopt an average consumption of 2·24 lbs. of coal per KW.H. generated, or 1000 KW.H. per ton, which would be equal to 3,420,000 B.Th.U. per ton. On this basis, to generate sufficient energy to supply 19,200,000 B.Th.U. to the swimming bath (without taking into account heat losses and compensation heat) 5·61 tons of coal would have to be consumed at the generating station. Take a boiler using coal and (or) coke at 75 p.ct. efficiency—there are records of higher efficiencies than that—20,160,000 of the 26,880,000 B.Th.U. of the ton of fuel would be transmitted to the swimming bath water. That is more than the heat required for raising the temperature by 24°. Mr. Hope takes an efficiency of only 25 p.ct. for coal-heated boilers used for raising the temperature of bath water, which means a waste of 75 p.ct. of the heat of the coal. This efficiency probably applies to the slipper baths with their intermittent requirements; but if we accept that as representing the efficiency for also providing the swimming bath water, it means that more than the heat transferred to the 80,000 gallons of water (19,200,000 B.Th.U.) would be realizable from 3 tons of coal. The 1 ton or the 3 tons compares with the 5·61 tons required for electricity generation to provide the same amount of heat. All we need say is that this is a scandalous misuse of coal. Incidentally, it may be mentioned that there are gas-fired boilers on the market which give an efficiency of 80 to 85 p.ct.

Extravagant Heat Expenditure.

Charged for Fuel Only.

Mr. Hope further states that the Borough Electrical Engineer agreed to supply current at off-peak load times at "a little over station fuel costs." This no ordinary commercial undertaking could do, and assert that it was a good commercial transaction. The charge per unit is 0·517d., and in the first (September) quarter's working, the cost per slipper bath was 2·33d.; the consumption being 4·52 units. If that is so, and the volume of water per bath was 30 gallons and the temperature 110°, then the temperature of the inlet or unheated water was more than 50°. In the December quarter, consumption averaged 6·04 units, which raised the cost for current per bath to 3·1d. If Poplar's present system of heating public bath water proves anything at all, it is that it is a waste of fuel, and of no advantage to the electricity undertaking, in that the current is supplied at a shade over fuel costs. This is not business on competitive lines; and therefore "Meteor's" thin boasting falls miserably to the ground.

Electric Cooking in L.C.C. Schools.

Nearly two years ago—to be exact, on July 31, 1923—the London County Council passed a resolution requesting the Education Committee to consider and report whether or not at appropriate centres cooking by electricity should be taught. The Committee have now reported that they have given the matter careful consideration. The time suggests that this must be true; but the fact that the Committee have arranged for only "experimental" installations at certain cookery centres appears to indicate that they are not yet satisfied that, for those who attend the Council schools, electric cooking is precisely what is required. We put this to the Committee—that all that can be taught in the schools which differs from instruction with a gas cooker is the management of the electric cooker. Heat is heat; food is food. When one comes to competition between the two systems in schools, then, if the young people or their parents are not to be "taken in," they must be told the relative costs (not at cut electrical prices per unit) of doing an equal amount of work on the two types of cooker—including all boiling operations such as are common on a gas-cooker in an ordinary house. We know Labour members of local authorities are keen to advance the interests of electricity—not that, on their own confession, they know much about the matter (other than the usual electrical platitudes), but the political policy of the Labour Party is nationalization, and electricity has been entered among the industries and services which are to come under State control in those wonderful days that are to come. Any and every step which will help towards this end is being taken by nearly all who profess and call themselves Labour-Socialists. They are to be pitied. Some of them are mentally as blind as bats, and badly require educating to assist them to see things in their true form. However, the Education Committee of the London County Council are going to watch the school experiments carefully, and a further report will be submitted when sufficient experience has been gained. That report, when in due season it arrives, will be read with interest, analyzed with care, and commented upon with justness and prudence.

Bad Companions.

In the equipment of buildings, electric light wires and gas-pipes should not be immediate companions. This has been demonstrated in no uncertain manner from time to time. According to the newspapers, the Royal Sussex County Hospital at Brighton—a hospital above all places—had a serious experience last Saturday week. An electric wire fused, which melted a gas-pipe, and ignited gas. Fortunately there was no panic among the patients; and the flames were got under in about half an hour. But it was an exciting half-hour. We have not yet seen an electrical contradiction of the fusing, nor, strange to say, has there been any authoritative statement to the effect that the gas-pipe was melted by a burning cigarette end, which some careless and uneconomical person threw away.

Mr. Pearce and Electricity Reorganization.

The Manchester Corporation are, it appears likely, about to lose the services of Mr. S. L. Pearce, General Manager and Engineer of the Electricity Department, who has rendered the city excellent service. He has been offered an important post by the Government. It is understood that it is in connection with the electricity reorganization schemes, so that, we take it, he will, if the appointment is accepted, become associated with the Electricity Commissioners.

Barking!

The electrical feature of last week was the starting, by His Majesty the King, of the large Barking Station of the County of London Electric Supply Company. It is the first super-power station for the Metropolis. Its ultimate capacity will be upwards of 750,000 H.P., or (say) 600,000 KW.H. The section inaugurated contains plant with a capacity of 125,000 H.P. or (say) 100,000 KW.H. For this, one report states, more than 4000 tons of coal will be required per week. We cannot vouch for the accuracy of this. The engine-room is designed for four turbo-alternators—two of 50,000 H.P. and two of 25,000 H.P. They produce current at 6600 volts; and this pressure is raised by transformers to 33,000 volts for economical transmission to sub-stations at a distance. Upon the first section of the power house and mains £2,500,000 has been expended, about £1,000,000 of which has gone in transmission mains. The whole station may be said to typify latest practice in efficient generation on a large scale; and it is the first real contribution to the unification of the electrical system for London and the Home Counties. One report, however, states that a wholly unified system for that large territory can hardly be expected before 1971. The electrical people consider this new station something really magnificent. They should, in order that heads may not get too inflated, have attention drawn to the reminder given by Mr. Milne Watson in his Presidential Address to the Society of British Gas Industries, that to supply to the community the heat energy delivered in gas alone—that is to say nothing of coke—by the Beckton Gas-Works, the Barking super-station would require to have ten times its present maximum capacity. Indeed, the present capacity of the Barking station is no more than the extension required annually by the largest London gas undertaking to meet the normal increase of business. Another point is suggested by the speech of the King at the opening. His Majesty said he was gratified to learn that the difficult problem of co-ordinating the numerous systems of supply within London and the Home Counties is approaching solution; and he trusts the development will spread throughout the country. There is something that ought to have had prior consideration, and that is the co-ordination of the use of the fuels of the country. That is an economic question of pre-eminent importance; but the Government have altogether overlooked or ignored it. His Majesty also referred to the reduction of the smoke of our large towns by the aid of electricity. We are afraid that commodity will not assist very materially in that direction, unless we are to eat with increased velocity into our coal resources. Electricity might claim to do a bit better in that direction if the co-ordination of the use of fuel was something that had materialized into a national system, and some other fuel than raw coal was used partially or wholly for steam-raising.

NATIONAL GAS COUNCIL.

Annual Report.

The following report, together with the statement of accounts, for the year ended March 31 last, having been approved and adopted by the Central Executive Board, was presented to the members at the seventh annual general meeting yesterday.

GAS REGULATION ACT.

Application for Orders, Section 1.—During the period under review six gas undertakings have lodged applications with the Board of Trade for the substitution of a standard or maximum price per therm in lieu of their existing price per 1000 c.ft., and 31 Orders have been made.

Section 1.—*Amending Orders.*—During the period under review, application has been made for a revision of the standard or maximum price per therm granted to gas undertakings under section 1 of the Gas Regulation Act in respect of three undertakings. Although these applications for an Amending Order are usually made by the local authority, it is interesting to note that in some instances an application for a reduction of the standard price has been put forward by the undertakers themselves.

Section 10—*Special Orders.*—During the same period 41 gas undertakings have lodged application under this section with a view to extending the powers conferred by their Private Acts and obtaining additional powers. It will be remembered that proposals were made in the House of Lords last year for altering the expeditious and inexpensive method of procedure prescribed by section 10, and that the Council took active steps to prevent a change of procedure as being a retrograde step and inimical to gas undertakings—particularly the smaller ones. The dissolution of Parliament in November caused the Select Committee of the House of Lords who were considering this question of procedure to cease its functions; but the present Government have restored the Committee, the terms of reference and the membership being practically as before. This Commitee received the views of the National Gas Council on the subject several months ago, the gist of which was that the existing system is eminently satisfactory. Small undertakings, in particular, could not bear the cost of parliamentary contests; and it is hoped and believed that the Select Committee will not materially disturb the existing procedure.

PUBLIC UTILITY COMPANIES (CAPITAL ISSUES) ACT, 1920.

Members were reminded of the forthcoming expiry of the above Act on May 20 this year, and as a doubt had arisen as to the correct legal interpretation of sub-section (2) of section 2 of the Act, Counsel's opinion was taken on various points that were not quite clear, and circulated to all members who were operating under a "consent" obtained under the Act in question. Members were also advised, if they were still in doubt as to their position after the expiry of the Act, to consult their own legal advisers at the earliest possible moment, in view of the situation that would be created after May 20.

LONDON TRAFFIC ACT, 1924.

The Council carefully watched the progress of this Bill, which received the Royal Assent on Aug. 7 last, and secured a number of

important amendments at the Committee Stage. The Act, as passed, ensures that earlier notice will be given to gas undertakings of programmes of work proposed by highway authorities than was the case with the original Bill. Opportunities are provided for gas undertakings affected to make earlier representations to the Minister of Transport in regard to such programmes, and generally the Act allows of closer co-operation between highway authorities and public utility undertakings than did the original Bill.

The officers of the Council attended a conference convened by the Minister of Transport on Feb. 23, with reference to the working of section 4 of the Act. An explanatory letter was sent to all gas undertakings likely to be affected by the London Traffic (Closing of Streets for Works) Order, 1925.

Factory and Workshop Act, 1901—Chemical Works Regulations, 1922.

The illness of the Chief Inspector and Deputy Chief Inspector of Factories caused considerable delay in getting a definite response to the representations made by the Council that certificates of exemption from the above regulations should be granted in suitable cases—particularly in the case of small undertakings.

Certificates of exemption have recently been issued to all the gasworks on whose behalf the Council have from time to time appealed in respect of one or two regulations. These certificates, however, are considered by the Council as quite inadequate; and they have again taken up the matter with the Home Office, and at the same time communicated with all the undertakings who have applied through them for exemption from certain of the chemical regulations, advising them also to write to the Deputy Chief Inspector, protesting that, as at present drafted, these certificates would afford no relief at all to their undertakings.

The Council are still in negotiation with the Home Office.

Mains of Insufficient Capacity.

The Council are glad to report that, after prolonged negotiation, a clause with regard to relief from the obligation on gas undertakings to give a supply of gas where the mains are of insufficient capacity has at last been agreed with the railway companies. Undertakings should, therefore, in the future be able to obtain the insertion of such clause in their Private Bills or Special Orders without difficulty.

Standard Cookers.

The Council have reported to all the members that the Parkinson Stove Company, Ltd., and Messrs. R. & A. Main, Ltd., are now in a position to accept orders for "Standard" gas cookers in large quantities, at special prices, according to the quantity required.

The Council have circulated a form of inquiry to their members to ascertain the estimated monthly requirements of each undertaking, in order that members may pool their orders, and thereby receive the benefit of the discounts obtainable, however small their individual requirements.

Rating of Machinery.

The Council appointed a Committee to investigate this difficult question, and upon their recommendation decided to give evidence before the Departmental Committee who were considering the matter. The gist of such evidence, which was given by Mr. William Cash, F.C.A., on Nov. 6, was that there was grave danger in dealing with the rating problem piecemeal, and that no satisfactory solution could be reached unless the question of the rating of machinery was dealt with in conjunction with the whole problem. The Committee were urged to recommend no principle in regard to the rating of machinery which would have the effect of so altering the incidence of rating as to affect prejudicially the gas industry.

The Departmental Committee have issued their report, which (although not adopting the recommendations of the Council) does not appear to affect materially the interests of the gas industry.

Mains and Cables in Highways.

The Council have been indefatigable in their efforts to protect the members against the endeavours of highway authorities to encroach upon the statutory rights of public utility undertakers in this connection.

The joint conference of representatives of gas, water, tramway, and electrical interests convened by the Council has on several occasions considered this subject at length. A comprehensive memorandum on the question has been prepared and circulated to members. The joint conference decided to confer with representatives of the County Councils' Association, the London County Council, and other bodies representing highway authorities, and such meeting is to be held on May 7, under the chairmanship of Sir Henry Maybury, Director-General of Roads.

Heavy work has also been entailed in advising and assisting individual undertakings in connection with claims put forward by highway authorities. County Councils have, in pursuance of their avowed policy, endeavoured to force undertakings to accept protective clauses in favour of county councils in their Private Bills or Special Orders. So far the efforts of the Council in resisting these claims have been crowned with success.

Railway Companies' Bills—Protective Clauses in Favour of Gas Undertakings.

The Council carefully examined the Railway Bills which were being promoted by railway companies this session, and wherever proposals appeared which were likely to affect a gas undertaking, the Council immediately communicated with the undertakings concerned, warning them of the dangers involved.

A joint conference of the Associations representing the gas, water, tramway, and electrical interests was convened by the Council to consider this question. This conference approved the substance of a draft standard clause prepared by the Council's Parliamentary Agents (Messrs. Dyson, Bell, & Co.) for insertion in Bills promoted by railway companies for the purpose of protecting public utility undertakings. Steps were being taken to obtain the insertion of this clause in Railway Bills introduced this session. Such Bills, however, were withdrawn. Consequently no opportunity was given for pressing the matter. The way, however, has now been paved for suitable action when Railway Bills are introduced in the future.

Proposed Government Financial Assistance to the Electricity Supply Industry.

This all-important question has received the closest attention of the Council. Appropriate communications were sent to Mr. Ramsay M'Donald and other Cabinet Ministers in the Labour Government, and a similar course has been adopted with Mr. Baldwin and the members of the present Government. The Council also set-up a Special Committee to investigate the whole question in all its bearings. The recommendations of this Committee have been carefully considered and approved by the Central Executive Board. The Parliamentary Committee of the Council have been appointed a Committee of Action, and will direct the campaign which is being undertaken to ensure that the views of the industry receive every consideration.

Members of the Council have been supplied with a full statement of the case against any scheme of State-aid for the development of the electricity supply industry.

Tar.

Serious consideration has been given by the Council to the question of promoting the sale of tar for the purpose of road making and road surfacing, and also to the question of countering the incessant and insidious propaganda which is being undertaken by other interests in this respect.

A Committee was appointed to investigate the subject, and steps have been taken to raise the necessary funds for publicity purposes. The Council also decided to take space in the Chemical Hall at Wembley for an exhibit of "British Tar for British Roads." The design for the stand has been executed by the well-known artist Mr. Norman Wilkinson. An expert has been engaged to take charge of the exhibit. Steps will be taken to ensure that the road surveyors of the country, and others who may be interested in the subject, will have an opportunity of seeing what is confidently expected to be a very attractive exhibit.

The Council have received evidence that the sale of prepared tar for road construction and road maintenance was injured considerably by the issue of an unfortunate and misleading circular of the Ministry of Transport, which was likely to be interpreted as meaning that washings from tarred roads were injurious to fish-life, whether the roads drained directly into fishing waters or not. The Joint Managers interviewed Sir Henry Maybury on the question; and, while receiving certain assurances (in themselves not unsatisfactory), were not successful in inducing the Ministry to issue a further circular explaining the true position.

Fixing of Geysers.

The Council have issued during the year a booklet of instructions for fixing geysers, intended for the use not only of gasfitters employed by gas undertakings, but of individual firms who undertake such work. This booklet has had a very good reception in the Press; and judging by the number of orders received from all parts of the country, its publication is widely appreciated.

Some difficulty has been experienced during the year in regard to the regulations of the Metropolitan Water Board regarding water supply to geysers. These regulations, which date from the year 1872, are no longer appropriate to modern practice; and steps are being taken with a view to having them amended in accordance with the specification issued by the Ministry of Health early in 1924.

Report on Carbon Monoxide.

The report to the Board of Trade by Mr. Butterfield, one of the Gas Referees, on the subject of "Carbon Monoxide in Public Gas Supplies," was published last July, and the Council appointed a Committee to consider the recommendations contained in this report.

This Committee held joint meetings with representatives of the Society of British Gas Industries (being makers of gas appliances), in accordance with the undertaking given by the Council to the Board of Trade in the letter appearing as an appendix to Mr. Butterfield's report, "with a view to submitting to the Board of Trade effective proposals, if such can be devised, for discouraging (and, if possible, preventing) the sale of undesirable types and qualities of fittings and appliances and the fixing of geysers and similar appliances without adequate and trustworthy means of ventilation—it being borne in mind that a great many gasfittings and appliances are not supplied by gas undertakings, but by firms over whom they have no supervision or control."

A questionnaire was dispatched to members, asking for the fullest possible information with regard to existing systems of inspection of piping, fittings, and appliances in dwelling-houses.

A Joint Sub-Committee from the Council and the Society of British Gas Industries was formed with the object of preparing a draft specification regarding the quality and size of piping to be used in gas installations.

The question of inspection of piping, fittings, and appliances is also being considered. Reports on these matters will be submitted to the Central Executive Board for consideration.

Instructions regarding the proper methods of fixing geysers have been widely circulated; and close attention is being given to the question of the elimination of undesirable types of apparatus.

Exhibitions.

British Empire Exhibition, 1924.—The Council lent their patronage, and gave financial assistance, to the highly successful Gas Exhibit at Wembley last year. The Council also took part in the World Power Conference which was held at Wembley in June-July of 1924. The gas industry was well represented by a Gas and Fuel Section, and some very interesting papers were read by representatives well known in the gas industry.

Smoke Abatement League of Great Britain—Manchester Confer-

ence.—The Council also were patrons of this Exhibition and conference, which was held in the City Hall, Manchester, in November last, and five delegates from the Council represented them at the conference in question.

District Executive Board.

The Council again tender their thanks to the District Executive Boards, Management Committees, Chairmen, and District Secretaries for their valuable help during the period under review.

Co-operation.

The Council have continued their policy of co-operation with other public utility associations with kindred interests, and much good work has been accomplished by joint conferences with these bodies. The British Water-Works Association have co-operated with the Council in more than one matter of importance to both the industries concerned; and this is only one of the many instances that could be cited which show the value of joint effort.

General.

There are innumerable other matters in connection with which the Council have taken steps to promote the interests of the gas industry or those of some individual undertaking.

Pressure was brought to bear upon the Port of London Authority, with the result that a further reduction was made in February in dock dues. This means that gas undertakings will have to pay less for coal passing through the Port of London.

Again, gas undertakings have been advised from time to time as to the eligibility of proposed schemes of work submitted by them to the Unemployment Grants Committee.

The scheme of workmen's compensation insurance inaugurated by the Council has worked very satisfactorily, and has resulted in premiums being quoted for this particular risk at a considerable reduction upon those quoted by the tariff companies. Two firms of insurance brokers are at present operating this scheme in respect of an increasing number of gas undertakings.

A Conjoint Committee with the Tramways Association, the British Water-Works Association, and the Incorporated Municipal Electrical Association have dealt successfully with several cases where borough accountants or treasurers have endeavoured to transfer from trading departments to their own supervision matters relating to wages, accountancy, collections, control of stores' accounts, &c.

The interests of the gas industry have been carefully watched with regard to the inquiry into the Standard Revenue of Railway Companies, and it is satisfactory to all traders that the appeal of the Railway Companies against the judgment of the Railway Rates Tribunal with regard to the computation of the standard revenue of the railway companies did not succeed.

Counsel's opinion has been taken in the past twelve months with regard to a new basis of assessment suggested by a well-known rating surveyor in the case of certain gas companies who were members of the Council; and it is extremely satisfactory to report that the figure finally agreed in these cases was a considerable reduction upon the original figures, which were the outcome of such computation.

The Council are at the present time engaged also in moving the necessary amendments to the Roads Improvement Bill and the Public Health Bill, 1925, and are submitting evidence before the Committee of the Board of Trade to inquire into British Trade and Industry.

That the Council's efforts on behalf of their members have proved of avail in more than one instance is borne witness to by letters received expressing appreciation of advice given and assistance rendered.

Income.—The total amount received by the Council by way of joint subscription to the National Gas Council, the British Commercial Gas Association, and the Institution of Gas Engineers (for research work) during the period under review amounted to £58,013, of which sum £16,642 is retainable for the purpose of the National Gas Council.

To the above figure of £16,642 there must be added interest on deposit account and payments by manufacturers in respect of sales of the Council's "Standard" gas cookers—viz., £232 and £241 respectively—making a total of £17,115, of which £1038 has been carried forward (being the proportion of subscriptions paid in advance) to meet the expenses which will be incurred during the financial year 1925-26. The income of the National Gas Council in respect of the year ended March 31, 1925, including the amount of £1732 brought forward from the last account, is therefore £16,909.

Expenditure.—The expenditure of the Council for the past year amounted to £16,882. The surplus on the year's working is therefore approximately £27, which decreases the accumulated deficit at the date of the last account to £2228.

Reserve Fund.—Of the sum of £1300 shown in the last account, as the balance of the reserve for the purchase of furniture and fittings for the Council's offices, at No. 28, Grosvenor Gardens, and for the expenses in connection with the acquisition of the premises in question, £234 has been expended for the purpose of additional office equipment, leaving a balance of £1066.

Membership.—The total number of undertakings subscribing to the funds of the Council at March 31, 1925, was 841, representing 88 p.ct. of the total make of gas in the United Kingdom.

D. Milne Watson, *President.*
W. J. Smith, *Secretary.*

May 12, 1925.

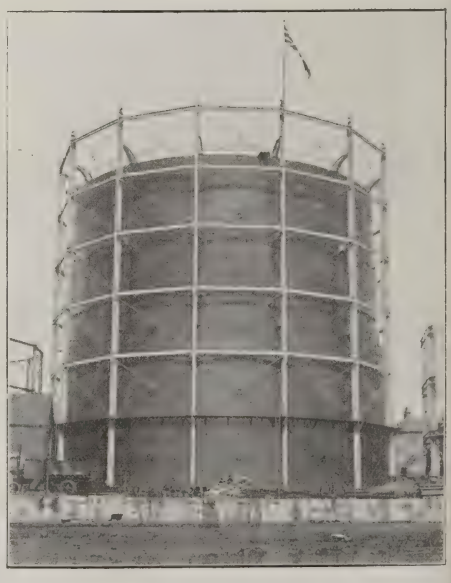
NOVEL GASHOLDER EXTENSION AT WEYMOUTH.

The difficult problem of increasing the capacity of a gasholder while still keeping it available for immediate service has been successfully solved at Weymouth, where a third lift has recently been added to a large gasholder without removing the gas, and under conditions that permitted the holder to be at call for use upon the district at any time during the progress of the extensions. The gasholder is a guide-framed one in a steel tank 100 ft. diameter; and the scheme by which the capacity was increased by 50 p.ct. while still keeping it in commission was devised by the Company's Engineer, Mr. J. T. Joyce, in collaboration with Messrs. Samuel Cutler & Sons, Ltd., who carried out the contract.

The guide-framing was first strengthened and heightened to the extent of the travel of the extended gasholder, and then the new lift was built around the existing second one (while still inflated with gas), from which it was temporarily suspended. The two-lift holder was therefore free to function in the ordinary way, but carried as a passenger the new lift nested round its circumference, first in skeleton form and finally in fully-sheeted condition. Considerable ingenuity was necessary in substituting below water level new cup carriages for the old displaced bottom rollers; but this and many other obviously difficult details were successfully negotiated without the least hitch, and the entire extension was completed in less than contract time.

The handing-over of the holder to the Company was made the occasion of a gathering at the gas-works on May 16, when the Mayor of Weymouth and many prominent townsmen made an inspection of the works.

At the subsequent luncheon, the Deputy-Chairman, Mr. S. S. Milledge, who presided in the absence abroad of the Chairman, Mr. Mark C. Frowde, gave a most interesting account of the history and present extensive operations of the Company, and highly complimented both the Engineer and the contractors (who were represented by their Chief Staff Engineer, Mr. W. T. Palmer) upon the successful completion of a notable example of gasholder engineering.



The Completed Holder.

University of Michigan.—From Prof. Alfred A. White, of the Chemical Engineering Department of the University of Michigan, we have received a copy of the annual Bulletin descriptive of the Course in Chemical Engineering, which can be obtained on request from the University authorities. The Department was established in 1897; and the present Head, Prof. White, who has been a member of the Department since its founding, has contributed significantly to its development. A new building was completed and occupied about a year ago, and is excellently equipped for teaching chemical engineering. The technique is taught through two courses. The first group—the preparatory group—is common to all engineering work at Michigan; while the second includes the special studies that constitute the professional courses in chemical engineering.

THE GAS EXHIBIT.

Every day sees some little addition, some finishing touch, o one or another of the beautiful parts which go to make up he Gas Exhibit at Wembley; and it is gratifying to learn that oth the attendances and the interest are maintained.

The demonstrations of Empire Food given in the Cookery Hall are proving very popular, and the audiences are growing is what is to be seen and heard becomes more widely known. The demonstrations take place four times daily—at 11.30, 2.30, , and 6.30—and every class of food is dealt with. There are omplete meals of several dishes, with hot and cold sweets. The people who attend show themselves most interested, and are of every class. As a matter of fact, quite a few would appear to spend the whole of their time in the Cookery Hall. They are evidently keen on gas cooking; and though this method has been in use for so long, and is now so general, astonishment is still expressed by some people on finding out how much can be done with the gas cooker. Talks on Empire food form a prelude to the demonstrations.

Good Lighting.

The lighting of the General Exhibits Hall, the Cookery Hall, and the Empire Food Hall attracts much attention. It is carried out by a series of ten-light outside type suspension lamps, which have been rendered most effective by the addition of really artistic silk shades. The lighting is well diffused; and the arrangement affords a good example of illumination for large halls.

Fruit Bottling and Jam Making.

Live Exhibits.

The value of the "live" exhibit is well exemplified by the fact that the gas-heated wafer-baking machine is a constant source of attraction to the people passing through the Palace of Industry.

Another feature of interest in the exhibit is the laundry, which is fitted with a live "Gladiron." The "Gladiron" itself is rather a big affair, weighing about 90 lbs.; but this need cause the manipulator no anxiety, for it is moved over the board by electricity in so easy a manner that anyone could use it. The iron is heated by high-pressure gas, provided by a small compressor. The laundry is fitted with hot water apparatus, ordinary domestic irons, a clothes airing cabinet, and a washer.

Cool Corners.

Which is the coolest and most restful spot for the tired visitor at Wembley? The "heat wave" of the past week urged sightseers to a solution of this problem; and the verdict seemed to be: "Within the Palace of Industry." One visitor said that his tired feeling speedily vanished as he reclined in one of the luxurious lounge chairs provided by the Gas Exhibit, and gazed on the cool marble of the charming Indian bathroom with its sunk bath. His companion voted for the near-by gas-ammonia machine, which will freeze a quart of ice cream or a variety of drinks in a few minutes, and to which reference was made in last week's "Journal." The Cookery Hall naturally appeals strongly to women in need of a rest; and it possesses the advantage of having ample accommodation for the youngsters.

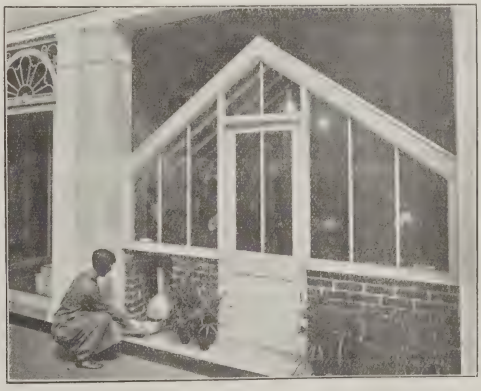
There appeared in "The Times" Empire Day Number, last Saturday, under the title of "Gas in the House and Workshop," an article in which the writer refers to the early investigations of Dr. John Clayton, and adds: "One wonders what would be the feelings of this pioneer could he inspect the British Empire Gas Exhibit in the Palace of Industry, and see the wonderful developments which have taken place in the inter-

Domestic Laundry, showing 90 lb. Patent High-Pressure Iron.

vening centuries." A description of the display follows; it is remarked that "credit must be given to the organizers of the Gas Exhibit for the artistic method they have adopted of revealing the complete story of the utilization of gas."

The "Quead" Gas Cooker.

Messrs. Wm. Geipel & Co., of Vulcan Works, St. Thomas Street, London, S.E., are showing in the Palace of Transport the "Quead" gas cooker, which roasts, toasts, grills, &c., by radiant heat applied simultaneously to both sides of the food. Baking, broiling, and plate warming are done in an oven above, with a separate door, by waste heat rising from the griller. For this apparatus are claimed "novel methods which create an entire revolution in modern family cooking." The griller and roaster consists of two vertical radiators, which are arranged opposite to each other and are adjustable, either nearer or further apart. Self-centring foodholders are provided to take chops, steaks, bacon, fish, toast, &c.; while for roasting there is a centrally supported meat hook, from which a joint or fowl may be hung. The hook is slowly revolved, by means of a substantial clockwork motor fitted to the outside of the oven There is said to be economy in the quantity of gas consumed as compared with an ordinary gas oven.



Greenhouse, showing Gas Heater Fitted Outside.

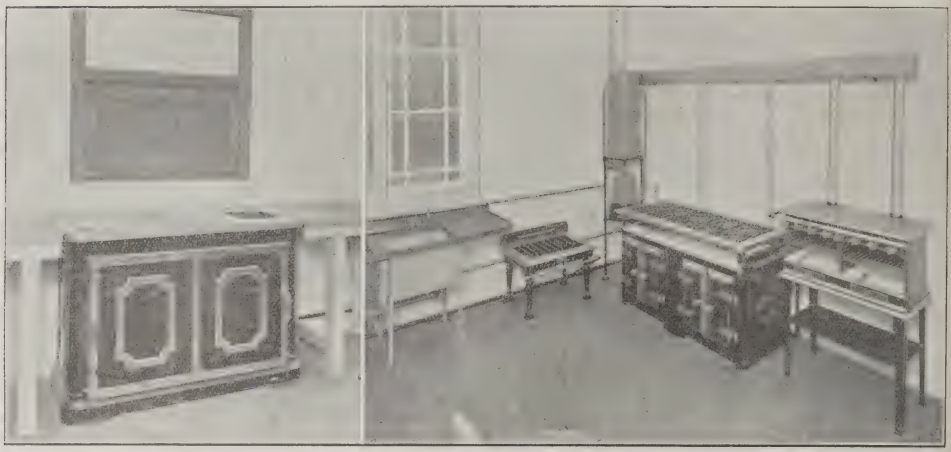
"Corolite" Concrete Mixture.

Among the various uses of concrete mixtures for housing schemes, mention has been made of the system of Corolite Construction, Ltd., of Goschen Buildings, Nos. 12 and 13, Henrietta Street, London, W.C. In an article which appeared in "The Times" some time back, on the housing display, Sir Lawrence Weaver made the following reference to this method

of construction: Among the most promising of the new concrete mixtures is that known as Corolite, "which in Holland and elsewhere has stood the test of many years' weathering. The broad idea of this mixture is indicated by its name. The type of aggregate and the method of mixing provide a wall substance well furnished with a system of internal cavities, so that the most violent beating of rain is said not to cause any passage of damp through the thickness of the wall. So effective is this barrier of air passages claimed to be, that builders in Holland have even abandoned the normal precaution of a damp-course, as moisture seems unable to arise through the wall from the foundations."

A "MAIN" GAS KITCHEN AT WEMBLEY.

Specially Installed for Civic Hall Banquets.



[*Photo. Campbell Gray.*

VIEWS IN TH KITCHEN EQUIPPED BY MESSRS. R. & A. MAIN.

Visitors to Wembley last year will recall the large Civic Hall, which during the run of the Exhibition was taken, for a week or so at a time, by one large town or another in the country for the purpose of drawing attention to special local industries, advantages of a district from the point of view of manufacturers, attractions for visitors, &c. For such a purpose the hall itself is admirably suited; but the lack of suitable kitchen arrangements was felt to be a considerable drawback. Therefore, in preparing the hall for a similar set of engagements this year, it was determined to remove the reproach that a first-rate civic banquet could not be prepared on the spot. Messrs. R. & A. Main, of Gothic Works, Angel Road, Edmonton, were approached on the subject, and have fitted up a kitchen with apparatus which will delight the most exacting chef. Different municipalities will bring their own staffs; but all will be able to produce the most perfect results in this convenient and absolutely self-contained kitchen, which is designed throughout for the very best class restaurant work.

The service has been arranged conveniently along one side of the kitchen—one part to receive through a hatchway dirty plates and dishes, and waste material which can be dropped through a hole into the bin below; the plates and dishes being then passed to the right for washing. There are separate hatchways for receiving and handing out; and both can be closed if necessary. There is a partition between the handing-out side and the receiving side, to prevent any possible contamination of the food being served by the dirty crockery as it is handed-in.

The Gas Apparatus.

On the left-hand side of the service is a gas hot closet, on which meat, poultry, &c., is carved up and kept hot while being handed out. In addition, of course, to serving as a carving table, plates and dishes are warmed and kept hot in the closet, which is provided with the usual sliding doors. There are two carving wells, with removable tinned copper linings, which are easily cleaned and handled; and on the top there is a bain-marie, for keeping sauces, &c., at the required temperature.

On the other side of the kitchen, one is struck first by the excellent appearance of the gas cooker—which takes the form of a Main "Duke of York" double-oven range, each oven having double doors, and being packed, and lined with enamelled steel sheets. The convenience of the double oven is that one can be used (say) for pastry, while another is required to be at a different temperature for roasting. The hotplate is fitted with the very latest "Efficiency" type burners; and everything about the cooker is designed for easy cleaning and convenient service.

Next to the cooker is a double-compartment grill, with porcelain enamelled fat collectors. Here, again, one compartment can be used for grilling steaks, &c., while the other may be toasting bread or scones.

On the other side, is a stock-pot stove, with one large double concentric ring burner; each ring being controlled by a separate gas cock.

Plenty of hot water for washing purposes is provided by one of the firm's "Energy" circulating water heaters, fitted with automatic thermostatic control valve, and connected with a 20-gallon tank.

All the gas apparatus is provided with flues passing direct to the outside atmosphere.

The size of the kitchen, and the cooking capacity it was required to provide, called for careful planning to secure the greatest advantages. This it received; and Messrs. R. & A. Main have provided a well-selected set of modern apparatus which will be the admiration of all who are called upon to work with it.

Green Gasholders.—In Denver gas distribution has been developed largely on the system of district holders; and these holder stations are in the residential sections. Under the Doherty Ideal Distribution System (the one adopted) it is essential that the district holders should be located at load centres, which, in a city using gas for practically all domestic purposes, will be in residential areas. Mr. Wallace L. Thackrey (of the Public Service Company of Colorado), in the magazine of the American Gas Association, explains that, in the first place, care is taken to purchase sufficient land, so that the general lay-out does not look crowded. The holders themselves are surrounded by trees, which, when a few years older, will be quite tall and full of foliage, thus hiding to a large extent the holder. The holder is painted green, the shade of which matches that of the tree foliage, thus eliminating any unattractive spots or patches which would otherwise be visible through holes in the foliage. Members of the Midland Association of Gas Engineers and Managers who were fortunate enough to take part in the recent visit to their President at Oxford, will recall the pleasing effect, upon which Mr. Caton was heartily congratulated, of painting green a holder erected in a rural situation.

HORLEY DISTRICT GAS COMPANY (ELECTRICITY SUPPLY) BILL.

A Retrograde Step.

The gas industry will learn with surprise and disappointment that this Bill, which, after a searching inquiry, was passed by the Earl of Clarendon's Committee in the House of Lords, has been rejected in what may well be termed a casual manner by a Committee in the House of Commons. This disappointment will be shared by all who have the Nation's welfare at heart; for the passing of the Bill would have constituted an important and rational advance along the path of progress towards a reasonable method of utilizing our fuel resources. In this country electricity cannot, by the very nature of things, hope to supplant gas in many fields—notably those of cooking and heating. At the same time there are definite requirements which electricity can satisfy well. What is needed, therefore, is a recognition of the limitations of electricity, and, following this, a go-ahead policy based on public service. No better method of producing cheap gas and cheap electricity exists—and at present this applies particularly to rural districts—than by centralization of gas and electricity supply at one station; and this procedure, because it is essentially non-wasteful, is in the interests of the Nation. Co-operation is not merely an ideal: it is a practical ideal. That which is at present preventing its yield of fruitful results is insular bigotry. The passing of the Horley Bill would have helped to break this down; as things are, its rejection will serve to strengthen it.

Electricity Commissioners *v.* Parliament.

It is unnecessary to go into the details of the Horley Bill, for the proceedings before the House of Lords have already been dealt with in the "Journal," and an account of those before the House of Commons Committee is published in later columns of this issue. To put the matter in a nutshell, however, and to emphasize the injustice of the latter Committee's decision, it may be stated that, so long ago as last June, the Horley Gas Company gave formal notice to the Electricity Commissioners that powers to supply electricity were to be applied for; and similar notice was given to the Board of Trade. In July, however, in view of the uncertainty with regard to the passage of Mr. Clarry's Bill, they passed a resolution to promote a Bill, and added that the Commissioners be informed. This was followed-up subsequently, it appears, by sending the Commissioners a copy of the Bill on the same day as it was deposited in Parliament. In October the parliamentary notice of that intention was published. In October, also, the Horley and District Electricity Supply Company, Ltd., were registered, and applied to the Electricity Commissioners for an Order empowering them to supply. The Electricity Commissioners held no inquiry, but in January, 1925, made an Order in favour of the Electricity Company. This fact certainly seems to indicate that the Electricity Commissioners held strong views of their own as to whether the Gas Company should have even a chance of succeeding; and the hearing before the House of Commons Committee developed into a contest between the Electricity Commissioners and Parliament. Unfortunately the former prevailed, owing, it may confidently be asserted, to the strong declaration of the Commissioners' policy by Sir Harry Haward himself, referred to later.

Arguments of the Opposition.

The main argument of the opposition was that competition between gas and electricity is a desirable—even a necessary—factor. Whatever the strength of such an argument as applied to a large industrial area, it has been proved that in a district like Horley it is in the public interest to have a combined supply. Every point put forward by the Gas Company was advantageous to the consumer. The same overhead charges and administrative expenses, the fact that cheaper capital could be raised by the Company, restriction of dividends, certainty of supply within twelve months—all these favoured the consumer. It was suggested by the opposition that, whereas the Electricity Company had a strong incentive to effect economies and reduce the price, in order to increase business, the Gas Company had not, because increases in the sale of electricity would to some extent be at the expense of gas. While the gas undertaking was operated under the sliding-scale, no such sliding-scale was attached to the electricity undertaking. To satisfy any qualms on this score, the Gas Company made a proviso to the effect that the Electricity Company should have the same power of revising prices and method of charging as they have in an Order. As to the bogey of competition, it was suggested by Sir Harry Courthope-Munroe that the House of Commons Committee should give the Gas Company their Bill, and then let the Ministry of Transport, if they thought fit, pass the Order also. There would then be the highest cut-throat competition in Horley. Of course, a good deal was said, towards the close of the hearing, of the bulk supply of electricity from the Barking station of the London County Electricity Company; but the Gas Company were entirely willing to take this supply, and, indeed, had a large potential consumer in the Sussex Electricity Supply Company, Ltd. In spite of all this, however, the Bill was rejected.

Mr. Clarry's Bill.

The Horley Bill has brought out the general view of the Electricity Commissioners in regard to Mr. Clarry's Bill, which, according to Sir Harry Haward, is that there may be cases where it is right that the supply of electricity should be entrusted to a gas company, because it may be the only means by which a district can get a supply. *"The prospects may be so poor that nobody except the gas company may be able to deal with the situation."* The Commissioners say that on general grounds it is preferable that the supply of electricity should be in the hands of the body whose sole duty is this supply. In other words, assuming that Mr. Clarry's Bill is passed, gas companies will have their case adjudicated by a prejudiced tribunal. They will be left with the crumbs which fall from their master's table. This is a highly disagreeable state of affairs.

SHORT BIBLIOGRAPHY OF COKE.

Compiled by H. J. Hailstone, A.M.I.Chem.E.

Interest in coke, its properties, manufacture, and use, has been stimulated by the competition organized by the "Gas Journal," at the instigation of Sir Arthur Duckham; and doubtless many intending competitors will have made searches into the literature of the subject for data and records of previous investigators. No apology is therefore needed for the publication of the list given below, which bears ample witness to the importance of the subject and the degree of study to which it has been submitted by numerous workers.

Some of the main contributions are here tabulated under general titles which indicate roughly the scope of the subject dealt with; but it must not be forgotten that enormous volumes of data exist under such headings as "Carbonization of Coal," "Gas Manufacture," &c., which might well be included under the heading "Coke." To have included these items in the present list would have entailed a task of indexing that the writer finds at present impossible, and would also prove too voluminous for a single issue of the "Journal."

The main points of earlier work are summarized in the recognized text-books on "Coke;" and for the titles of these (there is a considerable number) the publishers' catalogues should be consulted. The pages of the "Gas Journal" ("Journal of Gas Lighting" prior to 1917) give further testimony to the importance of the subject; and the indexes of former volumes are well worth investigation. Other journals dealing particularly freely with the technology of coke are "Fuel in Science and Practice" (published by the "Colliery Guardian" Company, Ltd., No. 30, Furnival Street, London, E.C. 4), and "Brennstoff-Chemie" (Verlag. W. Girardet, Essen, Germany).

Author.	Subject.	Reference (Title, Year, Page)
Agde & Recke	Structure	Brennstoff-Chemie. 1923 341.
Arend & Wagner	Reactivity	Revue de Métallurgie. 1924. 585.
Bahr	Reactivity	Stahl und Eisen. 1924. 1, 39.
Barker	Domestic	Fuel Research Board. 1922. Report 4.
Beilby	Structure	Journal Society Chemical Industry. 1922. 344T.
Berger	Formation	Gas- und Wasserfach. 1924. 424.
Breuer & Broche	Ignition	Brennstoff-Chemie. 1923. 168.
Broche	Structure	Brennstoff-Chemie. 1923. 343.
Bronn	Combustibility	Zeitschrift für angewandte Chemie. 1923. 410.
Bunte	Reactivity	Brennstoff-Chemie. 1923. 167.
,,	Production	Gas- und Wasserfach. 1924. 721, 739, 758.
Bunte & Fitz	Reactivity	Gas- und Wasserfach. 1924. 241.
Bunte & Kolmel	Ignition	Gas- und Wasserfach. 1922. 592.
Charpy & Godchot	Formation	Comptes-Rendus. 1917. 966.
Cochrane	Quality	Iron & Steel Institute. May, 1918.
Denstedt & Schaper	Ignition	Zeitschrift für angewandte Chemie. 1912. 2625.
Diller	Use	American Foundrymen's Association. 1911. 559.
Dodds	Specific Gravity	Chemical & Metallurgical Engineering. 1923. 324.
Erdmann	Ignition	Brennstoff-Chemie. 1922. 257, 278, 293.
Evans	Coking Theory	Journal Society Chemical Industry. 1918. 213T.
Fieldner	Structure	Chemical & Metallurgical Engineering. 1923. 1052.
Fieldner, Hall, & Feild	Structure	Industrial & Engineering Chemistry. 1915. 399, 742.
Findley	Analysis	Journal Society Chemical Industry. 1919. 93T.
Fishenden	Domestic	Fuel Research Board. Technical Paper 3. 1922.

Fischer	Combustibility	Brennstoff-Chemie. 1923. 33.
Frere	Use	Proc. Inst. Civil Engineers. 1891. iii. 59.
Fronheiser	Structure	Journal Franklin Institute. 1893. 34.
Gloetzer	Structure	Brennstoff-Chemie. 1922. 344.
Greenwood & Cobb	Structure	Journal Society Chemical Industry. 1922. 181T.
Hausser	Structure	Stahl und Eisen. 1923. 903.
Hewson	Combustion	Journal Society Chemical Industry. 1918. 60T.
Heyd	Combustibility	Brennstoff-Chemie. 1923. 339, 341.
Illingworth	Coking Theory	Journal Society Chemical Industry. 1920. 133T.
Kinney & Perrott	Testing	Industrial & Engineering Chemistry. 1922. 926.
Koppers	Testing	Stahl und Eisen. 1922. 569.
Kreisinger	Domestic	Industrial & Engineering Chemistry. 1921. 31.
,, & others.	Structure	U.S. Bureau of Mines. Tech. Paper 137 & 138 of 1917. Tech. Paper 138 and Bulletin 135 of 1918.
Kreulen	Structure	Chemisch Weekblad. 1923. 344. Brennstoff-Chemie. 1924. 233.
Lant	Coking	Brennstoff-Chemie. 1922. 97.
Lepsien	Combustibility	Journal für Gasbeleuchtung. 1918. 3.
Lewis	Structure	Industrial & Engineering Chemistry. 1923. 502.
Lierg	Coking	Zeitschrift für angewandte Chemie. 1922. 264.
Lissner	Sulphur	Brennstoff-Chemie. 1923. 305, 328.
Malleis	Structure	Industrial & Engineering Chemistry. 1924. 901.
Moldenke	Specific Gravity	Metallurgical & Chemical Engineering. 1910. 400.
Plenz	Ignition	Gas- und Wasserfach. 1922. 478.
Powell	Desulphurization	Industrial & Engineering Chemistry. 1920. 1077. 1921. 33. 1923. 951.
Rhead & Wheeler	Combustion	Transactions Chemical Society. 1912. 831. 1913. 51.
Rose	Specific Gravity	Industrial & Engineering Chemistry. 1922. 1047.
Schmolke	Specific Gravity	Stahl und Eisen. 1922. 1237.
Schreiber	Combustibility	Brennstoff-Chemie. 1923. 273, 341.
Selvig & Parker	Specific Gravity	Chemical & Metallurgical Engineering. 1923. 547.
Sherman & Blizard	Reactivity	American Institute of Mining & Metallurgy. 1923.
Shimomura	Manufacture	Chemistry & Industry. 1923. 556.
Simmersbach	Structure	Stahl und Eisen. 1914. 108.
Sinkinson	Theory of Coking	Transactions Chemical Society. 1920. 839.
Sinnatt & Moore	Ignition	Journal Society Chemical Industry. 1920. 72T.
Stober	Use	Stahl und Eisen. 1919. 525, 567.
Sutcliffe & Evans	Combustibility	Transactions Society Chemical Industry. 1922. 196T. Iron & Steel Institute. 1923. 75.
Terris & Schaller	Specific Heat	Gas- und Wasserfach. 1922. 761, 780, 800, 818, 832.
Thau	Combustibility	Chemical & Metallurgical Engineering. 1924. 306, 347.
,,	Quality	Stahl und Eisen. 1923. 1127.
,,	Production	Stahl und Eisen. 1922. 1153, 1242.
Thorner	Reactivity	Stahl und Eisen. 1886. 71.
Weill	Properties	Revue de Métallurgie. 1905. 557.
Weyman	Combustion	Transactions Society Chemical Industry. 1925. 47T.
Wheeler	Reactivity	Journal Iron & Steel Institute. 1923. 27.
,,	Ignition	Chemical Society Transactions. 1918. 945.
,, & Tideswell	,,	Chemical Society Transactions. 1919. 895.
Wibaut	Sulphur	Brennstoff-Chemie. 1922. 273.
Wirmer	Combustion	Zeitschrift für angewandte Chemie. 1918. 134.

"B.C.G.A." Conference at Harrogate.—Unfortunately it has been impossible to include in this issue the report which is in hand of the valuable conference held last Thursday, under the auspices of the British Commercial Gas Association. It will appear next week.

THE TAR POSITION.

[Communicated.]

The present quotation for tar in this country is 30s. per ton. In May of last year it stood at 50s. per ton.

With prices falling as they are, and stocks increasing, producers would welcome any proposals having for their object the stimulation of sales in such a way as to provide an adequate return for the cost of distillation and its incidental charges. The time is undoubtedly opportune for British tar manufacturers to bestir themselves, having regard to the circumstance that France now urgently needs the commodity they have to offer. It is a fact that, while the mileage of roads in England, Wales, and Scotland aggregates 38,600 (24,000 classified under A, first class, and 14,600 under B, second class), roads in France of various classes corresponding in traffic conditions to the British A and B classes aforesaid, cover a mileage of 40,000. It may be added that the French classification of roads is somewhat different from the British method, as it is based on questions of property.

Now the production of tar in England, Scotland, and Wales for the year 1923 was: From gas-works, 960,000 tons; from coke ovens, 715,000 tons; and from other sources about 25,000 tons—making a total of 1,700,000 tons. In the year 1924 France produced from her gas-works 230,000 tons, and from her coke oven works 190,000 tons—a total tonnage of 420,000, utterly inadequate for her requirements.

Coming to the question of the utilization of tar on roads, in Great Britain, 300,000 tons of prepared tar were sold for this purpose. In France the sale was only 150,000 tons of tar, mostly in its crude state. Prices in France for crude tar in January, 1924, were 350 frs. per ton at the works; in January, 1925, the price was 230 frs. At that date the price of prepared tar was 370 frs. per ton delivered at the works.

On the roads in the Riviera, and on other well-known motoring roads in France, the inconveniences arising from the dust nuisance have become very acute. The French are crying out for road-spraying material to remedy the evil. There are heavy stocks of tar in the stores of her Ally ready for disposal. What can be done to come to equitable terms as between buyer and seller? Are the difficulties insurmountable?

The Comité Central des Producteurs et Distillateurs de Goudron en France, it is believed, would welcome an arrangement advantageous to both parties. Which of them will make the first move to negotiation?

We are well aware that at Wembley special attention is being directed to tar problems, with what effect there has not been sufficient time to show. What is strongly urged is that the potentiality of France as a tar purchaser should at once be recognized, notwithstanding considerations arising from respective values when rates of exchange are taken into account. The views of "Journal" readers on a subject of great commercial interest to both countries are invited.

Installing an Under-Water Gas Syphon.

The Boston Consolidated Gas Company have lately completed the installation, under the Chelsea Creek, East Boston, of a 30-in. cast-iron gas syphon; and as some rather unusual features were involved in the building and placing of it, a description of the work has been contributed by Mr. D. S. Reynolds, the Company's Engineer of Construction, to the pages of the "American Gas Journal." From this it appears that the main supplying East Boston crosses the Chelsea Creek by means of a 24-in. steel pipe from the shore to the vertical leg of the 30-in. syphon; down 55 ft. to the horizontal portion—which is 35 ft. 6 in. below mean low water, and is 150 ft. long between risers—then up about 48 ft. to the 24-in. steel pipe connecting to the East Boston shore. The steel pipe is supported on wooden pile towers, driven into the bed of the creek at distances of about 35 ft. Each tower consists of four oak piles, supporting steel saddles, to which the pipe is rigidly clamped. Expansion and contraction are provided for by means of large flanges flexible enough to allow for the lengthening or shortening of the pipe due to changes in temperature. All joints in the steel pipe are made by bolts, with red lead putty. The 30-in. syphon itself is made of cast iron 1⅛ in. thick. It is pointed out that this thickness was selected to provide a pipe that would be certain to remain sunk—the ordinary weight of gas pipe being able to float if both ends were tightly closed and the pipe filled with gas or air—as well as to afford protection against the effects of corrosion. There is an electrically driven deep-well pump to remove the condensation from the syphon. When the horizontal pipe had been placed safely in position on the supporting piles, the two vertical legs were assembled with poured-lead joints on the deck of a lighter, and the bulkheads in the tops of the drip-trees were removed, allowing the water to fill the pipe. The vertical legs were then lowered, so that the spigots entered the bells of the drip-tees, when a diver made the joints with lead wool, and caulked them with a compressed air driven caulking tool. The syphon was afterwards pumped out, and the two 24-in. steel pipes connected to the vertical risers.

SOCIETY OF BRITISH GAS INDUSTRIES.

ANNUAL GENERAL MEETING.

THE Annual General Meeting and Dinner of the Society took place in the Hotel Cecil, London, W.C., last Wednesday, under the Presidency of Mr. D. MILNE WATSON, D.L., M A., LL.B., who delivered his address.

MINUTES OF LAST MEETING.

The minutes of the previous annual general meeting were taken as read, and signed.

The SECRETARY (Mr. Arthur L. Griffith) said unfortunately Mr. J. Wilfrid Drake (the Chairman of the Council) was unable to be present; and the following cablegram had just been received from him:

s.s. "Leicestershire," Lisbon.

Please ask President tender my congratulations to new President, Chairman, and officers, and also express to all members my appreciation and thanks for their kind assistance and co-operation during my year of office. Wish you successful and enjoyable meeting.—J. WILFRID DRAKE.

Alderman Fred J. West (Lord Mayor of Manchester) was prevented from attending by an important Council meeting; and Prof. Arthur Smithells had written:

I am extremely sorry that I shall not be able to attend the annual meeting or the dinner. I particularly regret my absence on this occasion. I have been in the surgeon's hands, and after six weeks of nursing home am now in the convalescent stage. I am getting on very well; but, of course, it takes time to recover after this kind of ordeal.

Please convey my regrets.

ARTHUR SMITHELLS.

He had also received other apologies for absence.

On the proposition of the PRESIDENT, it was agreed that the following telegram should be dispatched to Prof. Smithells:

The Society of British Gas Industries in general meeting much regret that you are unable to be with us to-day, and send best wishes for your speedy recovery.—MILNE WATSON, President.

REPORT OF THE COUNCIL.

The CHAIRMAN then presented the nineteenth annual report of the Council, on the work of the Society during the year 1924-25. It was as follows:

We have to record the death of the following members:—

William H. Tilley, of the firm of Tilley Bros.

J. G. Stewart, Chairman of Stewarts and Lloyds, Ltd.

The Society wishes to offer its congratulations to the following gentlemen:

Sir Dugald Clerk, K.B.E., who has been awarded a Royal Medal of the Royal Society for his application of scientific principles to engineering problems, particularly to the development of the internal combustion engine.

The Rt. Hon. Sir Henry E. Duke, on the Peerage conferred upon him by His Majesty the King under the title of Lord Merrivale.

Alderman Fred J. West, C.B.E., on his election as Lord Mayor of Manchester.

Institution of Gas Engineers.—We learn with much pleasure that the Lord Mayor of Manchester has been nominated for election as an honorary member of the Institution at their annual meeting in June.

British Empire Exhibition, 1925—Gas Exhibit.—Members will be pleased to know that very satisfactory arrangements have been made with the Exhibition Authorities not only for having the same prominent position in the Palace of Industry as in 1924, but for additional space, which has been acquired upon very advantageous terms. This will enable the cookery lectures to be given in a separate hall, and so prevent their being interfered with by noise and movement, as was the case when they were delivered in the Second Hall last year. Arrangements have also been made, upon the suggestion of the Empire Food Committee, for lectures and demonstrations to be provided and our hall used to bring food subjects before the public. There will now be proper office accommodation; and a drawing room has been placed at the disposal of women journalists for rest, writing, rendezvous, &c., at the suggestion of Lady Burnham, on behalf of the Society of Women Journalists. It thus appears likely that the Gas Exhibit will this year be a greater centre even than before for propaganda on behalf of gas. The increased space provided has allowed a greater number of exhibits to be shown. The British Empire Exhibition Committee have awarded the Society a bronze medal in recognition of our co-operation in the 1924 Exhibition.

Gas Safety Committee.—The Society is co-operating with the National Gas Council in connection with the recommendations in Mr. W. J. A. Butterfield's report to the Board of Trade, and especially with regard to the requirements of safe fittings. A Joint Committee has been formed consisting of eight members of each body. It is hoped that good results will emanate from the efforts of this Committee.

Trade Mark "SOBGI."—The registration of the trade mark "SOBGI" has now been completed, and certificates granted by the Patent Office under the following classes:

Class 8.—Gas Meters, Gas Regulators, and Gauges.
" 13—Gas Fittings made of Metal.
" 15—Glass for use in connection with Gas Fittings and Appliances.
" 16—Refractory Material for use in connection with Gas Heating Appliances.
Class 18—Gas Stoves, Gas Ranges, Gas Radiators, for Heating; Gas Geysers and Gas-Heated Water Circulators in the nature of the Stoves.

Retort Setters.—The terms of the Manchester Agreement between Section I. of the Society and the Amalgamated Union of Building Trade Workers expired on May 1, 1924; but by mutual understanding this was continued *pro tem.*, pending a satisfactory conclusion being arrived at regarding an extension of the agreement and the introduction of a new signatory in the Federation of Gas Employers. The new Agreement, which was signed in London on Nov. 13, 1924, is working satisfactorily, and will continue in operation until May 1, 1926. It is hoped that its provisions will remove many anomalies which existed before owing to the difference in rates and conditions between the gas-works' and contractors' employees.

Standard Gas Valve Flanges.—The recommendations of the Joint Committee of the Institution of Gas Engineers and our Society have now been approved, and agreement has been arrived at between the Committee and the British Engineering Standards Association. We understand that particulars of the standard flanges will shortly be published.

Standardization of Medium Size Inverted Mantles.—This matter has been under consideration by the Lighting Section, and a certain amount of agreement has been reached. It is hoped further progress will be made.

Refractory Materials.—Active work is being carried on by the members of the Fireclay Section; and everything is being done to improve the manufacture of refractory materials. Classes have been formed in Stourbridge for workers in the industry, and are meeting with success.

Register of Names of Gas Apparatus.—As the outcome of a suggestion from the Gas Stove Section, a register of names of apparatus has been prepared from the schedules sent in; and in the event of a new piece of apparatus being brought out, the register can be searched by any of the members, to see if the name has been anticipated.

Illumination Committee.—Sub-Committees have been formed by the British Engineering Standards Association to deal with the questions of:

1.—Standardization of methods of testing, and specifying the characteristics of, glassware and translucent materials.
2.—Fittings.

A representative of our Council has been appointed on these Sub-Committees, and we shall give all the support we can.

Revision of Railway Classification of Goods.—Messrs. Tweedy & Holt, of Halifax, have watched our interests at meetings of the Railway Rates Tribunal; and their reports on railway matters are issued in the "Bulletin" and the monthly circular-letter to the members. Among other matters which have been under consideration, and on which action has been taken, may be mentioned:

Board of Trade Inquiry into British Trade and Industry.
National Confederation of Employers' Organizations.
Unemployment Insurance (No. 2) Act, 1924.
Company Law Amendment.
Preferential Tariff Treatment of British Goods in Australia and New Zealand.
Canada—Customs Tariff.
Standardization of Contract Conditions.

Smoke Abatement Exhibition—Manchester.—The Society gave its patronage to this exhibition, which was held in Manchester in November, and was represented at the Smoke Abatement Conference in connection therewith.

British Commercial Gas Association.—The propaganda work of the Association, especially in connection with the Gas Exhibit at Wembley, is proving beneficial to all engaged in the gas industry. We congratulate the Association on its very successful annual conference in Liverpool, at which a number of our members were present.

University of Leeds—Celebration of Coming of Age and the Jubilee of the Yorkshire College.—The Society was represented at the celebrations in December last in connection with the Coming of Age of the University and the Jubilee of the Yorkshire College.

Quarterly Bulletin.—The Council have felt that the "Quarterly Bulletin," while doing very useful work, was too intermittent to be of real service by keeping our members in close touch with the work of the Society; and we have decided that only two half-yearly issues—one after each of our general meetings—shall be retained, which will contain full reports of our meetings in the spring and autumn. Circular-letters will be issued after each monthly Council meeting, so that the members will be kept in touch with matters which are being dealt with. They trust their efforts in this particular direction will be appreciated, and that the more frequent communication with the members will tend to a greater interest being taken in the Society, and to cement the individual interests for the benefit of the industry.

Membership.—The membership of the Society is steadily increasing; some additional firms having recently become members.

City and Guilds of London Institute.—The prizes in connection with the City and Guilds of London Institute's examination in gas engineering, gas supply, and gasfitting have been duly awarded and announced in the Technical Press.

Visit to Manchester.—The April meeting of the Council was held in Manchester, when the members were welcomed by the Lord Mayor, who afterwards entertained them to luncheon at the Town Hall.

The Council take this opportunity of according their best thanks to Alderman West for his kindness and hospitality.

Presidential Badge.—A handsome badge of office, to be worn by our President, was presented during the year by Mr. J. Wilfrid Drake, Chairman of the Council; and our President was invested with it at the autumn general meeting.

The Presidency.—The Society wishes to accord its best thanks to Mr. D. Milne Watson, D.L., M.A., LL.B., for his valuable services during his presidency. On his retirement he has been pleased to accept the office of a Vice-President; and we hope that we may long have the benefit of his counsel and advice. We also desire to place on record our best thanks to the Rt. Hon. Lord Weir of Eastwood for his able address at the last annual meeting; also to Mr. J. Wilfrid Drake, Chairman of the Council, for his paper at the autumn meeting entitled "Some Aspects of the Metric System," which led to a good discussion. The Council have much pleasure in announcing that the Rt. Hon. Sir Alfred Mond, Bart., M.P., has accepted the presidency of the Society for the coming year.

On behalf of the Council,
J. Wilfrid Drake, *Chairman.*

The Report Adopted.

Mr. B. B. Waller said that, in the absence of the Chairman, it fell to him to move the adoption of the report. He thought they might congratulate themselves upon the varied number of matters that the report embraced. Members would appreciate that the Council had had a fairly active year, with the diverse subjects that had come before them for review. In glancing over the report for the previous year, he noticed that a prominent subject on that occasion was their new offices. They were firmly established there now; and the more they saw of them the more they liked them. They did the Society great credit, and yet not greater credit than was due to an organization of their standing. It was, however, felt that perhaps a little more use might be made of these offices by the members in general; for at the present time they seemed to be utilized almost entirely for the Council meetings. It was open to all the members to make use of them. Another matter to which he would allude was that of Sectional meetings. It was felt that a little more zeal and interest might be shown in calling meetings of the different Sections, which would be profitable to all concerned.

Praise for the Gas Exhibit.

Reference was made in the report to the British Empire Exhibition, 1925. When the question of a gas exhibit there was first brought before the Council, there was, perhaps, some little divergence of opinion—more particularly between the Heavy and the Light Sections—as to whether a repetition of the gas exhibit would be desirable. However, the members of the old Exhibition Committee of the Council had an opportunity of meeting the members of the National Gas Council; and the feeling at that meeting was overwhelmingly in favour of repeating the gas exhibit at Wembley this year. After that view had been expressed, he thought it would be the unanimous opinion of the members of the Society that the exhibit should be repeated, in view of the highly satisfactory results secured last year. Those of them who had already visited Wembley, and seen the new exhibit, would agree that the decision arrived at had been a wise one. The exhibit was a remarkable piece of work, and reflected great credit on the Gas Exhibit Committee and all concerned. Their best thanks were due to Mr. F. C. Tilley, their late Chairman, for his untiring efforts, and the very great interest he had taken in the matter of this gas exhibit. He understood from Mr. Tilley that, if possible, the spirit of co-operation between the various bodies who had been responsible for the gas exhibit had been even more strongly evinced this year. They believed that the cost of the exhibit this year might be round about one-half of what it was last year; and the Society were hoping that their members would subscribe in proportion to what they did on the previous occasion, and so maintain the good opinion that was formed last year of the assistance they gave to the exhibition from a monetary point of view, over and above the part they took in supplying material for the exhibit.

"A Very True Advertisement."

Personally, his opinion with regard to the exhibit was that it was bound to be a very fine advertisement for them. In this connection, he sometimes thought of what their old friend the late Mr. Walter King used to say to him: "When times are bad, advertise freely; and when times are good, do what you like about it." Mr. King believed strongly that when things were bad they should extend their advertising. Well, they could not say at the present time that things were good in the country. Trade was difficult, and orders were scarce; and he felt that this gas exhibit at Wembley was going to be of very great service to them.

While on this subject of the gas exhibit, he was reminded of the other side—the electrical side. They had all been struck by the extraordinary obsession of politicians of all parties at the present time—that electricity was the only thing to improve this earth, and that there was nothing to compete with it. However, he had just glanced at the President's address, and he saw this matter was very fully dealt with there; so he would say no more about it. It was mentioned in the report that the trade mark "SOBGI" was now registered. He saw that the classes to which it applied were more or less limited; but he thought it was going to be of very great service to the makers of apparatus who could use it. It would set a value on the goods that were supplied by members of the Society, and be a definite guarantee of quality to the purchasers. The Manchester agreement arrived at regarding rates of wages between the contractors and the gas companies was a very excellent piece of business. It was a matter of regret that some understanding could not be come to with those engaged in the engineering trade. Personally, he believed that if some addition could be made to their wages at the present time, with a *quid pro quo* in the shape of some alteration of hours of labour, &c., a better feeling would exist and more work would be obtained from their employees than was now the case. Negotiations were proceeding; but they seemed very slow. It was more work that was required for increased production. A friend of his had recently returned from Germany, where he visited a very large works of gas plant makers; and there he found the men were working about 60 hours a week, for the equivalent of some 31s. in the case of a skilled mechanic. It was almost hopeless for this country to try to compete in the open markets of the world against conditions such as these. The attention of members might be directed to the note in the report regarding the register of names of gas apparatus. It was a suggestion made recently, and it appeared to be a good one, that any makers who had registered names of apparatus should have them entered in the book of the Society kept for the purpose, so that they might be sure that there was no overlapping, and that names were not duplicated. As to the quarterly "Bulletin," perhaps members would say what they thought of the change-over to the issue of two half-yearly "Bulletins," and a monthly *résumé* of the work of the Council, so as to keep members a little more up to date. In the last monthly notice sent out, members were asked to let the Secretary have some information which was desired by the National Gas Council with regard to the amount of capital and the number of hands employed in their various enterprises. Only approximate figures were required; and no doubt members would send these along as soon as possible.

The membership of the Society was well maintained, and at the moment he believed numbered about 125. Their best thanks were recorded in the report to the President, Mr. Milne Watson, for his year of office. With his charm of manner and the breadth of vision displayed by Mr. Milne Watson all through his period of office, the year seemed to have passed all too quickly. Sir Alfred Mond possessed all the qualities necessary to make an admirable successor in the Presidency.

Mr. Albert W. Glover formally seconded the adoption of the report, which was unanimously agreed to.

The accounts for the year 1924 were also adopted, on the proposition of Mr. Thomas A. Braddock, seconded by Mr. J. Winson Scott.

Council Representatives of Sections.

The President announced that the following gentlemen had been elected to serve on the Council as representatives of the Sections:

Mr. J. W. Broadhead, M.I.Mech.E.,	to represent	Section I.
Major Richard Miles, B.Sc.	,,	II.
Mr. Albert E. Guest	,,	III.
Mr. R. J. Milbourne, J.P., F.C.S., A.M.Inst.C.,E.	,,	IV.
Lt.Col. W. R. Glover, C.M.G., D.S.O.	,,	V.
Mr. Cyril G. Davis, M.I.Mech.E.	,,	VI.
Mr. Philip H. Sugg	,,	VII.
Mr. Thomas F. C. Potterton	,,	VIII.
Mr. John Orme	,,	IX.
Mr. Frank West	,,	X.
Mr. H. J. Donkin, M.I.Mech. E.	,,	XI.
Mr. Joseph Taylor	,,	XII.
Dr. E. W. Smith, D.Sc., F.I.C.	,,	XIII.

New Chairman and Vice-Chairman of Council.

Mr. Samuel Cutler proposed that Mr. B. B. Waller be elected Chairman of the Council of the Society for the ensuing year. The name of Mr. Waller's firm, on the constructional side of the gas industry, was known everywhere; while Mr. Waller himself had served for about ten years on the Council, and in a quiet and unobtrusive manner had accomplished a great deal of useful work. He would therefore bring to the Chair a very ripe experience.

Mr. Harry J. Donkin seconded the proposal, which was heartily agreed to.

Mr. Waller briefly acknowledged his election, and moved that Mr. Frederick J. Gould be elected Vice-Chairman of the Council. Mr. Gould, he said, had also served many years on the Council, and in due course would make an excellent Chairman. He had done a great deal of work, particularly in connection with the Lighting Section.

Mr. Frederick C. Tilley seconded the motion, which was unanimously carried, and acknowledged by Mr. Gould.

Other Officers.

Mr. Charles Clare was re-elected Hon. Treasurer, on the proposal of Mr. G. H. Pearson Perry, seconded by Mr. Waller.

The appointment of Mr. E. J. Davison as Hon. Secretary was eed to on the motion of Mr. Albert Cliff, seconded by Mr. J. Milbourne.

Mr. J. W. Broadhead proposed the appointment of Mr. Wilfrid Drake as an elective member of the Council. They e all sorry Mr. Drake was unable to be with them. He had n a very efficient Chairman, and it was their wish to retain services on the Council.

Mr. C. A. Goodall seconded the motion, which was passed.

Moved by Mr. Clare, and seconded by Mr. H. M. Thornton, ssrs. Albert Cliff, F. C. Tilley, C. A. Goodall, and R. B. dgson were appointed elective members of the Council.

The re-election of Messrs. Cash, Stone, & Co. as Auditors to Society was agreed to on the motion of Mr. R. B. Hodgson, onded by Mr. Gould.

The Council were thanked for their services, on the proposi- n of Mr. Charles S. Bennett, seconded by Mr. Ernest ST; and a similar compliment was paid to the Hon. easurer, the Hon. Secretary, and the Secretary, on the motion the President, seconded by Mr. Thornton.

Mr. Milne Watson then proceeded to deliver the following sidential Address.

AS AND ELECTRICITY IN RELATION TO UNEMPLOYMENT AND INDUSTRIAL DEPRESSION.

I feel I need offer no excuse for taking as my subject the estion of gas and electricity in respect of the services which y are both capable of rendering to the country, as there is obably no subject which is being more discussed at the pre- t time than electricity; and we who are engaged in the gas ustry are anxious that the merits of our industry, particu- y at such a time, should not be overlooked.

Public attention has been drawn in recent years to electricity her than to gas, and great prominence is given, in the Press d elsewhere, to schemes for its development. For example, new electrical super-generating station at Barking, which d a ceremonial opening by H.M. the King yesterday, is very ich in the public mind at present. To preserve a correct se of proportion, however, it should be realized that, to sup- to the community the heat energy delivered in gas alone by near neighbour the Beckton Gas-Works, the Barking super- tion would require to have ten times its present maximum pacity. In fact, it may be said that the present capacity of s super-station is no more than the extension required nually by the largest London gas undertaking to meet the rmal increase in business. Perhaps the reason why public ention is focussed upon electricity is that its development in tain other countries has been spectacular, that the uses to ich it can be put are so varied, and that there is an element mystery and romance about it.

It is not unnatural in these circumstances that electricity has racted the attention of politicians to the extent of almost be- ning a battle-cry. The Labour Party have taken it up as a omising field in which to try experiments in nationalization, d as a help towards the solution of unemployment problems; Liberal Party have taken it up in an attempt to revive their litical fortunes, and incidentally deal with the problems of al utilization and unemployment; and, finally, the Conserva- e Party have undertaken an investigation into the whole bject.

Prevalent Ideas—and Pious Hopes.

Apart from the political aspect of the question, the prevalent ea among Members of Parliament seems to be that it would lp to solve the unemployment question in two ways: (1) By ploying a large number of men in the production of electrical nt and apparatus, in the laying of main cables, and in the ring of houses; and (2) that increased facilities for the supply electricity, piously hoped-for at cheaper rates, would enable dustry to manufacture at lower costs, and thus help to recap- re the lost markets of the world.

Labour's Proposals.

In July of last year, when the Labour Government were in ice, Mr. Snowden, Chancellor of the Exchequer, indicated at it was the policy of his Government to grant subsidies out the National Exchequer for the development of electricity in is country. He suggested that conferences should take place tween the Associations connected with electricity supply and e Electricity Commissioners, in order that agreement might reached as to the schemes of development which would rank r subsidies—in particular:

(*a*) The establishment of uniform frequency—a figure of £10,000,000, spread over three years, was mentioned in this connection.

(*b*) Government assistance for main transmission lines—"a system of grants to those authorities undertaking approved works individually or jointly, sufficient in amount to make-up the net revenue (after allowing for depreciation or sinking fund) attributable to the particular work, at a rate of interest to be fixed by the Treasury on the expenditure incurred until such time as the net revenue is sufficient to meet the charges, but not more than ten years." This proposal appears to mean that the Government would make good the deficit so long as the works remained unremunerative—with a time-limit of ten years.

(*c*) The development of electricity in rural areas. The then Government suggested that the amenities of country life could be improved. Electricity would serve for the lighting of cottages, and for electrical domestic apparatus. It was even suggested that houses might be wired on something like the hire-purchase system.

The meetings took place, and suggestions were made that the Electricity Commissioners should entertain proposals from the electrical undertakers for trunk mains and general extension to rural districts, &c., the Government to guarantee interest on capital invested for (say) ten years, or until the scheme was remunerative. Suggestions were also made that subsidies should be given for the erection of main transmission lines, overhead distribution lines to small townships, wiring and equipment of premises, and trunk mains for bulk supplies of electricity to existing distributors.

Present Proposals.

At the present time it is announced that the Transport Ministry are working out a scheme, based upon the recent report of Lord Weir's Committee which has been exploring the subject. The matter is to be debated, I believe, to-morrow, and it is understood that the Government intend shortly to introduce a Bill. As a result of all this, it is evident that there is a danger of vast sums of public money being expended in developing and bolstering-up the electricity supply industry in the near future.

An Unwarranted Excuse.

It is given as an excuse that this is necessary because the electricity industry has been hampered in the past by statutory enactments, and it cannot be expected to modernize itself at its own expense. I suggest that these handicaps have been no more than in the case of the gas industry; that the real reason is that individual undertakings have developed on lines which are not uniform; and that this is, in the opinion of certain electrical experts, a serious handicap to co-operation between adjoining undertakings. The money, if granted, would be used to defray the cost of the changes-over to standard plant, and to extend distribution to fields hitherto considered uneconomical. It is not to be wondered at, in these circumstances, that considerable surprise, indignation, and anxiety are felt in the gas industry, which is in many large fields the direct rival of electricity.

In This and Other Countries.

Many comments have been made that the electricity supply in this country lags far behind that of other countries, as regards quantity used, efficiency of production, and price charged. Dealing now with the production of electric current per head of population in various countries, as quoted during the World Power Conference at Wembley last year—viz.:

	Units per Head.		Units per Head.
Switzerland	700	Sweden	364
Canada	612	France	147
Norway	493	Germany	141
United States	472	United Kingdom	139

it will be noticed that the highest figures are attained in those countries in which not only is water power available, but where, in comparison with this country, coal is very expensive. With France and Germany we compare not unfavourably.

It is from the coal in this country that we draw all our supplies of power, whether they are ultimately utilized as steam, gas, or electricity. There is no supply of "white coal" (as water power is commonly called), such as there is in Canada, the United States, Norway, Switzerland, and many other countries. It is possible that in course of time the water resources of Scotland and Wales may be utilized; but these are far removed from the great industrial centres of England, and even if, eventually, the tides are harnessed for the purpose, these sources are not practicable at present. Moreover, it should be remembered that the capital cost of such water-driven installations is much higher than for steam-driven generating stations.

Doubtful Economy of Long-Distance Transmission.

Seeing that water power is not available in this country for large-scale generation of electricity, proposals have been made for the centralization of the production of electricity in the shape of super-stations; but here, again, the trouble is that, if the cost of long-distance transmission is added to the heavy capital charge, it is found that such savings as are effected in the fuel costs are counterbalanced. It should be remembered that in this country it is usually cheaper to convey coal over long distances than to convey electric current.

To quote from the recent address of the President of the Institution of Electrical Engineers: "It is obvious that in a country where coal is dear the advantages of centralization of power production are greater than in a country such as our own where coal has been cheap. As a consequence, the development of electricity supply in countries where water power is available and where coal is dear has been much more rapid than in this country, not, it will be noted, necessarily due to a spirit of greater enterprise, but primarily because it was the best or only economic solution of the power problem."

What is essential to a country is a cheap supply of power, light, and heat. It is assumed by far too many people in this country that the prosperity of the country should be judged by

the quantity of electricity consumed. I, on the other hand, consider that, in judging the country's resources, all circumstances must be taken into consideration, because upon the nature of such resources will depend the lines upon which development can take place with the greatest advantage. This is not generally realized.

The Service Rendered by Gas.

In this connection, I would now draw attention to the magnitude of the service rendered by gas to the community in this country. In Great Britain the consumption amounts to 275,000 million c.ft. annually, which equals approximately 1320 million therms; and taking the population at an estimate of 47,350,000, this works out at 28 therms per head of the population. The amount of electric current required to do the work actually performed by this quantity of gas in its various uses by the public is calculated at 487 kw.h.—that is, units—per head of the population. Therefore, the service given by gas *per capita* in this country exceeds that given by electricity in the United States of America. If one adds the heat energy supplied by gas undertakings in the form of coke, the figure per head of population is more than double that quoted. It is worthy of note that, although gas manufacture has not developed in the United States of America in the same proportion to the population as in this country, partly owing to the fact that supplies of natural gas have become available, it is making great progress, having increased by no less than 33 p.ct. during the last six years, in spite of the intense electrical development of that country. I am not claiming, of course, that gas can be used with advantage for every purpose. There are instances in which electricity is specially adapted—such as railway traction, power distribution to a large number of units (we use electricity in gas-works); and for lighting it has its special uses. On the other hand, there are purposes for which gas is peculiarly suited; and in these fields, in which gas is mainly used, there is no advantage in changing-over to electricity. In fact, positive disadvantages to the nation would accrue if such a course were adopted, as I shall show. For example, heating, industrial or domestic, and cooking are fields in which gas far out-rivals electricity.

The Bye-Products which are Lost in Generating Electricity.

Moreover, in dealing with this question, it must not be overlooked that electricity produces no bye-products. Gas manufacture produces per annum (1924)

0,000,000 tons of smokeless fuel—viz., coke.

172,000,000 gallons of tar, which in distillation provide:

Prepared road tar.	Beta naphthol.
Carbolic acid.	Salicylic acid.
Creosote.	Anthracene.
Naphthalene.	Pitch, &c.

167,000 tons of sulphate of ammonia (one of the chief agricultural fertilizers), cyanide, and other bye-products.

Thus the gas-works recover all the valuable bye-products from the coal, including the raw materials for dyes, drugs, disinfectants, benzole (the only home-produced motor fuel), fertilizers, &c., which are destroyed when coal is burned in its crude state, as in electrical generating stations.

Coal Conservation *v.* Coal Wasting.

This brings me to the all-important question of the conservation of coal. The comparative thermal efficiencies of gas and electricity works are such that, of every 100 heat units in the coal used, the most efficient electric generating station utilizes only 20 p.ct.—a loss of 80 p.ct.—whereas in efficient gas manufacture the loss is only 15 p.ct. That is, gas-works can supply to the community as gas, coke, and chemical products, 85 p.ct. of the total heat value of the coal. It is clear, therefore, that in utilizing to the best advantage the nation's coal supplies, gas is playing a far more important part than electricity, and gives to this country distinct advantages over a country which depends entirely upon electrical power and heat.

State Subsidies Wrong in Principle.

In my view, the granting of subsidies to industry—especially to industries which are sheltered—is wrong in principle. The gas industry was built-up in face of tremendous opposition and prejudice, and in face of many restrictions of a statutory character, many of which exist at the present moment. Yet in Great Britain the gas industry is certainly as efficient as that of any country in the world. On the manufacturing side, large sums of money have been spent in modernizing plant to keep pace with the better practice brought about by experience and greater knowledge, and on large mains in lieu of small ones to deal with increased loads and with the increased volume that altered conditions in manufacture and utilization have necessitated. All this has been paid for by the gas industry itself. What is the matter with electricity? It is true that per head of the population there is not so much electricity used; but that is because in this country industrial development commenced earlier, and has been along other lines, and to a great extent electricity is in competition with other forms of power already in being, instead of having, as in some countries, a virgin field for development.

The question at once arises, Why should not the electrical industry itself pay for any improvements in the method of the generation and distribution of current? The electricity industry cannot possibly be termed a "depressed" industry, as we shall clearly prove. We are also entitled to ask, from the country's point of view, What advantages, if any, are there in the alleged "improvements"? For instance, is a policy of erecting large super-stations, linked-up all over the country, a sound policy for Great Britain? Will super-stations provide electricity much cheaper than smaller sources of electricity?

Super-Stations Not Necessarily the Most Efficient.

In the recent report issued by the Electricity Commissioner it is recorded that the highest thermal efficiency was obtained by a small internal combustion engine station. For steam operated plants the best efficiencies are by no means confined to the super-station; but, in any case, where improvements have been effected in the over-all thermal efficiency, they are so small as to have only a slight effect upon the cost to the ordinary consumer. This is because the cost of distributing mains and apparatus is high, and in the case of intermittent use, as for lighting, distribution may be said to add 300 p.ct. to the cost of generating.

Concentrating the generation of current at super-stations entails long and expensive high-tension lines and losses of power. This is the reason why it is more economical to bring coal from (say) South Wales to London for the generation of electricity than it would be to establish generating stations at the coal fields and transmit the current. The cost of generation at super-stations, *plus* transmission to switchboards of existing distributing centres by the proposed national system, has been placed by one of its advocates at 0·6d. per unit. Many of the great centres of industry have already electric supplies generated at this price, and have, therefore, little advantage to look for. It would appear that it is only districts uneconomically situated which would benefit, at the expense of the State, by what is proposed.

Possibly in future developments centralized production will offer advantages in the better utilization of capital, more skilful operation, and pooling of the load; but, even if it were so, why should the State provide money for this purpose? There are many other industries which have been hampered in the past by legislation and other obstacles, and which have become old-fashioned, and are not able to compete favourably with their trade rivals. Is it sufficient to prove that modernization is needed for grants to be received from the State? If Parliament does insist on subsidies being given, they should be given only by way of loans; and, in fairness to other rival industries, loans should be given to them on similar terms. ["Hear, hear." But as this means that the requirements of every industry should be on the same basis, it would be much better if there were no subsidies at all.

Electricity in No Need of Subsidies.

I now ask for proofs that the electricity industry is financially embarrassed. To judge by the available figures, there are no signs whatever of this. "Garcke's Manual" gives the average dividends on ordinary capital of 176 electric supply companies in 1914-15 as 4·04 p.ct., and of 194 companies in 1923-24 as 7·1 p.ct.; and, in addition, there is evidence of large increases in reserve funds. Such up-to-date figures as are available give even greater evidence of prosperity. Take, for example, a number of the London Companies:

—	Amount to Reserve.		Dividend	
	Pre-War Year	Post-War Year.	Pre-War.	Post-War.
	£	£	P.Ct.	P.Ct.
Charing Cross Company—				
West-End undertaking . .	22,000	46,000	5	15
City undertaking	18,000	93,000	*Nil*	10
Chelsea	14,000	32,000	5	12
Kensington	8,800	33,000	9	15
London Electric	33,000	63,000	4	10
Metropolitan.	23,000	206,000	3½	11
City of London	51,000	184,000	9	15
South London	7,500	67,000	5	15
South Metropolitan . . .	15,000	119,000	*Nil*	15

These facts indicate that the electrical undertakings must be in a position to attract all the capital required for legitimate and useful expansion of business. ["Hear, hear."] We do not but suspect that the real reason for State aid being sought for the electrical industry is that there is a body of persons in this country who wish to see an expansion of electricity apart from any economic consideration, and are anxious, therefore, that for this purpose the taxpayer should bear the burden. There are no signs of lack of funds for remunerative schemes, or that the industry is unable to shoulder its own burdens. If the electrical industry is to be bolstered-up and given unfair advantages, it is a very serious matter for the gas industry.

The National Importance of the Gas Industry—in War and Peace.

The country cannot afford to neglect the gas industry. Gas is the best and most natural way to use coal in this country for a great variety of purposes, and in it and its bye-products lies the

tion of the smoke problem. It will be remembered that ng the late war it would have been impossible to provide high explosives necessary to carry on without the aid of the industry; and in times of peace it is no less essential to the luct of other industries.

the gas industry were to be prejudiced by the unfair com-ion of a subsidized rival, and people were to be induced to electricity by the provision of a cheap supply of current at cost of the public generally, and incidentally at the cost of gas industry as members of the public, a great injustice ld be done to our industry. [" Hear, hear."] Municipali- alone have expended capital to the extent of £58,000,000 in gas undertakings, which are perhaps the most successful nples of municipal trading. If they are to be exposed to competition of a State-aided rival industry, whatever age is done to their interests will fall eventually upon the ayers.

here are 312 municipal electric supply undertakings, with orized loans totalling £108,331,266, and 150 municipal elec-traction undertakings, with authorized loans amounting to ,258,120. Speaking of municipal undertakings, in cases re the generating costs of these undertakings exceed those of current supplied by a super-station, they would, under the onal scheme, so far as we know, be compelled to shut-down generating plant. The interest on the capital of the plant thrown idle would have to be reckoned against the reduc-in the cost of current. In the case of companies similarly cted, it is apparently the intention to compensate from State ls.

Gas Employs Far More Labour than Electricity.

we were looking at this question merely from the point of of unemployment, it is interesting to note that the gas stry employs more than five men for every one that the tricity industry employs for the same output of heat energy. refore, the bolstering-up of electricity, should it bring about eduction in the amount of gas consumed, would put the ntry in no better position as regards employment in these industries taken together.

he same remark applies to the associated industries which Society of British Gas Industries comprises. They employ our on a very extensive scale in the manufacture of plant, chinery, apparatus, and materials in connection with the nufacture and utilization of gas and its bye-products. The lity of their work has been kept up-to-date and on a high le by standardization of essentials and by healthy competi-. Their work is of national importance in that it is helping to in the greatest efficiency in the development and application of stored-up energy in coal; also, in that many of these British s have been able to compete successfully in the markets of world. This progress has been made without financial aid n the State, direct or indirect; and now, if State subsidies to give an unnatural fillip to electricity, any increased em-ment there may be in the manufacture of electrical ap-atus is bound to be negatived by a corresponding reduction our own associated industries. The Society of British Gas ustries, like the parent industry, asks for nothing more than competition and natural development on economic lines. Hear, hear."]

Cheap Electricity Fails to Cure Tyneside Depression and Unemployment.

he belief that the development and increased supplies of tricity will remove unemployment in other industries in this ntry is entirely fallacious. There is no greater depression he present time than on the North-East Coast, where there the largest super-stations in this country, belonging to an tricity undertaking probably as up-to-date and efficient as in the world, supplying cheap electricity over 1400 square es of industrial area. Although the mining, steel, shipbuild- and other industries have availed themselves of this cheap tric supply, it cannot lift them out of the abyss of depression which they find themselves; it represents too small a pro-tion of their total working costs. In shipbuilding, marine ineering, locomotive building, and iron foundries, the cost of tricity represents under 1½ p.ct. of the total working costs; hat any reduced price of current cannot materially affect the sent abnormal conditions. It is stated that recently, in con-tion with a contract for eight new ships for the Blue Star e, where the total expenditure was to be in the neighbour-d of £2,700,000, foreign tenders were no less than £300,000 ow those of British firms.

Hopes Doomed to Disappointment.

The Prime Minister has said that " we consume less units of trical power than countries far inferior to our own in indus-l production," and that " there is no doubt that to-day we paying infinitely too much for our light and for our power." ould point out, however, that in the case to which I have rred a cheap supply is available; but it is obvious that this is sufficient, and that even if electrical power were supplied s of cost it would not make good more than one-eighth of the crepancy in these shipbuilding tenders. The causes of unem-yment go a great deal deeper than the cost of electricity; and ose in responsible positions should hesitate before they put ir faith in the proposition that electrical power, however cheap, will re-start trade and solve the unemployment problem in this country. [" Hear, hear."]

These remarks are made in no spirit of the dog in the manger. Electricity has its uses, as well as gas, and we have no ill-wish towards our rivals. We maintain, however, that they should not be unduly favoured by the State as against gas.

The latent energy stored in coal is the greatest natural asset in this country, and upon it depends our ability to hold our position in the civilized world. Already the exhaustion of the more cheaply-worked seams is in sight, and the need for conservation is very urgent.

Electricity Wasteful of Coal.

The approximate consumption of coal for domestic purposes in this country is in the neighbourhood of 35 million tons per annum. Prof. Cobb has shown that, assuming only one-quarter of the heat in the coal thus burned is usefully employed, to supply this heat by electricity instead would require, on the most optimistic assumptions, approximately 55 million tons. Now the same amount of heat supplied as smokeless fuels—gas and coke—by gas-works would require under 30 million tons. Thus the adoption of electricity, if it could be universally adopted, would mean the additional expenditure of 20 million tons, as compared with a saving of 5 million tons by the gas-works solution—a difference in favour of gas manufacture of 25 million tons of coal, *plus* the valuable tar and ammonia products required for other industries, which would be as much a loss in the process of electrical generation as they are in the present domestic practice of sending them up the chimney.

It would be nothing short of scandalous to allow State funds to be given to foster the use of a far less efficient medium, and so deliberately encourage waste of the national resources. [Applause.]

Sir Arthur Duckham, in proposing a vote of thanks to Mr. Milne Watson for his address, and for his services to the Society, said the President was worthy of all the praise that one could give to him; but they in the gas industry knew that in Mr. Milne Watson they had the leader, the head, of their industry. They knew the burden upon his shoulders, and all that he had done for the unification of the industry; and they knew that in a time of crisis like the present, in industry in general, and in the fuel industries in particular, Mr. Milne Watson would follow-up the work that he had done. He felt certain that the address just delivered was the most vital Presidential Address to which they had ever listened; and it was an address which was greatly needed to-day. Friends of his had come to him and asked whether they should sell gas shares, as gas was finished, and there was nothing left but electricity. In fact, an entirely false position had been built up in this country by the present cry of electricity for everything. As a matter of fact, the country did not want electricity; it did not really care about electricity. What this country wanted was a cheap and efficient supply of energy, in whatever form it might be, suitable for its requirements; and the great danger of the present situation was that inquiries, such as Lord Weir's Committee, had been only on the basis of electricity, and had not been on the basis of the general fuel position of the country—which should be the basis of any inquiry. It seemed to him a terrible thing to crystallize generation of energy on an 80 p.ct. inefficiency, or 20 p.ct. efficiency, such as was entailed by the proposed super-power stations. Surely this was not a time for great expenditure, but to make the best use of what one had got. There was much in this country that should help to cheapen power. As to unemployment he was entirely at one with the President. A case had come under his notice of two similar jobs in England and America. The wages in America were just four times the English rates; but the cost of the job was actually the same—showing that the output of the American worker was four times the output of the English worker. This extra output was not due to an electric motor being attached to each worker. Naturally, one wondered what the Government were going to do about electricity. Inquiries had been held; but all one knew as to the results was that the electrical engineer walked about with his tail up, and when asked what was going to be done replied: "Wait and see, but it is something pretty good." One feared the Government had made up their minds before the question had been put forward for discussion, and that thus the thing might be rushed through without properly weighing matters up. This must be bad for the country, the whole situation having only been considered from the one point of view. They must all feel frightened that some very grave error might occur, unless there was proper time for consideration and consultation upon these matters. Finally, as far as one could see, an entirely bureaucratic scheme was foreshadowed. They had seen a little of the present Electricity Commissioners. A works wanting to put in a gas engine and dynamo plant was referred to the Electricity Commissioners—although it was a gas-works—and an attempt was made to force the Company to take their power from the electricity station, though the price would have been far higher than that at which they could generate the current on their own works. It was foreshadowed that the Commissioners in London would have absolute control of the generation of electricity throughout the country. It would be a magnificent thing for the gas industry if they did. Nothing could kill an industry more surely than such control from one central authority. Any attempt to

rush a scheme through without considering the matter from all points of view must be disastrous. Mr. Milne Watson had a very hard year in front of him in every direction; and he wished to tell him on behalf of the members that he had the hearty support of one and all of them. ["Hear, hear."]

Mr. Waller said he was very pleased to have the opportunity of seconding the vote of thanks to the President for his very able address on the subject of electricity, and for his services to the Society during his year of office. On every occasion when it was necessary to consult him, he gave them the impression that the work of the Society was the only subject of any importance to him at the moment, though they knew how overburdened he had in reality been during the last year with other urgent affairs.

The vote having been carried with acclamation,

The President remarked that it had been a great pleasure to him to be associated with this very distinguished body of industrialists. He was sure he had learned as much from them as they could possibly have learned from him; and his year of office had been a singularly pleasant one. In the gas industry, whether on one side or the other, their great object was to pull together for the general good. With regard to the subject of the address, this was certainly going to be a pressing question for them during the next twelve months. It was not going to be disposed of by one speech from the Presidential Chair of the Society. This electricity "stunt"—if he might so term it—had got a great hold on people, who forgot altogether that gas had already done more in the direction of smoke abatement than electricity had ever done or was ever likely to do. The chief offender in this respect was the domestic chimney; and it was the gas undertakings that could, and did, deal with them. The gas industry was going to do away with the smoky atmosphere of the towns. Providence had put this work into their hands to do. Members should never cease putting the whole matter before people in influential quarters, and trying to get them to see the error of their ways. In the first place, to do as was proposed would not solve the problem of unemployment; and, secondly, it would be an act of injustice. There were able men in the electrical industry who were quite capable of raising any money that was really necessary. It was the business of the gas industry to expose the folly of the proposals now being made.

The New President.

The President (continuing) said it was now his very great pleasure to present to them the new President, Sir Alfred Mond. [Applause.] It was hardly necessary for him to introduce that gentleman to them; his name was a household word all over Great Britain, and among gas people it was well known. No one had rendered greater service to this country in commercial matters than Sir Alfred Mond, and they looked to him as one who understood some of their problems. If the Government would only consult Sir Alfred, he himself had a scheme for dealing with unemployment which was probably a great deal better than the electricity one suggested by the Government. They were all honoured that such a distinguished public man had found time, among his numerous other duties, to accept the Presidency of their Society.

The Right Hon. Sir Alfred Mond, Bart., M.P., said he regarded it as a very great honour indeed that they should have so kindly elected him to this responsible position. He felt, however, a much greater sense of trepidation than would otherwise have been the case, because he was succeeding in office such an expert in all gas questions as Mr. Milne Watson, to whose masterly address they had just listened. This address showed that Mr. Milne Watson combined, with great technical and commercial ability, also statesmanlike qualities. As for himself, his connection had been more with the furnishing of cheap power by means of producer plants and gas engines, and with a firm well known among gas engineers—Messrs. Ashmore, Benson, Pease, & Co., of Stockton-on-Tees—in supplying plant for gas-works. He did not wish to enter into the very large subject which the address had opened up. He would say, however, that politicians were well known to be ignorant men on technical matters. [Laughter.] He heard people talking gaily about super-power stations who did not know the difference between a volt and an ampère, and who had never seen a dynamo. "Super" meant nothing at all to any technical person. The question of whether large apparatus was preferable was one of pounds, shillings, and pence; and there was a great deal to be said on the side of limitation of units in all forms of plant. For instance, there was the question of spare plant and parts. One could easily develop to a size where the capital outlay in this respect became so high that, when they took this and depreciation into account, the financial results would be worse, though the technical results might be a little better. Politicians, as he had said, were not, on the whole, very well acquainted with technical subjects. Electricity had come much to the fore in countries where water power was cheap and coal dear. But the assumption that they must necessarily follow the same course in this country had always seemed to him to be quite unwarranted, unless they could demonstrate that other conditions intervened. He was rather surprised that it had been so long before they had a paper of this character, and that so little publicity had been given to gas; and he would very much recommend that a copy of this address should be sent by the Society to the Prime Minister, to Mr. Lloyd George, and to Mr. Snowden, as well as to Members of Parliament generally ["Hear, hear"], so that they at any rate would have the aspect of the case presented to them. Gas had been established so long that people had lost interest in it; electricity was a newer baby, and therefore likely to attract more attention. The position of the gas industry, its importance to the country, its functions in relation to domestic heating and lighting, and its industrial uses, should be thoroughly recognized by those who were responsible for dealing with a complex problem presenting so many aspects. If he could render any assistance to the gas industry, he would be only too pleased to do so.

Annual Dinner.

Later the members and a large number of guests met again in the Hotel Cecil, where just over one hundred sat down to the annual dinner, and spent a thoroughly enjoyable evening. Perfect arrangements, backed up by topical speeches and some charming musical items, made the occasion a memorable one alike to members and guests. The President (Mr. D. Milne Watson, D.L., M.A., LL.B.) was in the chair; and on his left hand there sat the Right Hon. Sir Alfred Mond, Bart., M.P. (the President-Elect), Sir Arthur Duckham, K.C.B., M.Inst.C.E., Mr. William Cash, F.C.A., Mr. Samuel Cutler, A.M.Inst.C.E., M.I.Mech.E., Lt.-Col. C. F. T. Blyth, C.M.G., LL.D., Mr. Frederick C. Tilley, M.I.Mech.E., Mr. Thomas Hardie, M.Inst.C.E., Mr. J. W. Broadhead, M.I.Mech.E., Mr. Philip G. G. Moon, Mr. J. Conway Davies, and Mr. Arthur L. Griffith. To the right hand of the President were the Right. Hon. Sir Hamar Greenwood, Bart., K.C., M.P., Mr. B. Waller, Assoc.M.Inst.C.E., Mr. J. Ferguson Bell, M.Inst.C.E. (President of the Institution of Gas Engineers), Mr. Frank H. Jones, M.Inst.C.E., Mr. Charles Clare, Mr. R. W. Foot, Mr. Douglas H. Helps, Assoc.M.Inst.C.E., Mr. F. W. Goodenough, Mr. Henry D. Madden, M.Inst.C.E., Mr. Cyril G. Davis, M.Inst.Mech.E., and Mr. John Terrace, M.Inst.C.E. The programme of music was arranged by Mrs. Millicent Russell. The toast of "The King" having been honoured,

The Society.

The Right Hon. Sir Hamar Greenwood, Bart., K.C., M.P. said fate had decreed that he should be their guest that night, and propose the toast of "The Society of British Gas Industries." He appreciated the compliment of being invited to do so. At the same time, he must frankly say he could not possibly have a tithe of the knowledge of these great industries which was possessed by the youngest of the members. But he could say something in a general way. He wished to say something of the President, who would respond to the toast, and who spoke with the prestige of a knowledge of the subject which was possibly unrivalled; and he wanted also to say something—and here he could speak with most intimate knowledge—of the President-Elect. Sir Alfred Mond and he had been a great many years in Parliament together. They had sat in the Cabinet which he (the speaker) still thought was the best Cabinet that had ever presided over the destinies of this country; and he was sure that his friend agreed with him. He felt bound to say of him that, if they were to choose half-a-dozen of the leading business men of the great parent country of a great Empire, Sir Alfred Mond would be one of them; and he thought he could say that Sir Alfred was one of the outstanding and illuminating enrichments of the commercial and political life of the country. He (the speaker) was not agreeing with him every time now; and it did not necessarily follow that he (Sir Hamar) was wrong. But he was bound to confess this—that, if he were right, Sir Alfred could put his case with facility, eloquence, and conviction that he regretted he could no himself equal. However this might be, he congratulated the Society upon having as their President-Elect a distinguished statesman and a leader of industry, not only in this country, but in the Empire, who could stand up in the House of Commons and command the attention of that difficult and hypercritical, and not always—should he say—knowledgeable, assembly, on industrial matters. As to their President, it was to be regretted in some ways that he had left the noble profession of the law to become Governor of the Gas Light and Coke Company; and that, instead of hanging criminals who should be hanged, he spent his time in declaring fine dividends and increasing reserves. [Laughter.] He did not know whether he was always satisfied to be the distinguished Governor, and the successor of a great many distinguished Governors, of the Gas Light and Coke Company, or whether he regretted sometimes that he was not able to put on a black cap and do something for somebody. Now he had always thought himself that the history of the gas industry represented one of the greatest tests—and successful tests—of British character. He had taken occasion to read it up, although in days gone-by he knew well the late Sir Corbet Woodall, who was one of the most enthusiastic members of that Society, and one of the leading men in the gas industry of the country. He had always thought that from the earliest days of this industry, which had commenced over a hundred years ago, it had had to wage a constant fight to overcome ignorance and break-down tradition; and in the more recent years they had had to fight a competition which was already severe, and might grow still severer as time went on. They found that the celebrated Duke of Wellington to the day of his death believed in candles; and as long as he was in authority, he insisted upon every soldier continuing to carry candles in his knapsack, as he had done in the days of Marlborough and at Waterloo. Prejudices died hard in those days, and even now; but this could be said—that here in this little island the gas industry commenced and through English engineers and English capital it spread throughout the whole of Europe, and to other parts. There was a time, he supposed, when hardly a town of importance in Europe did not have its gas plant put down by the capital of English investors. ["Hear

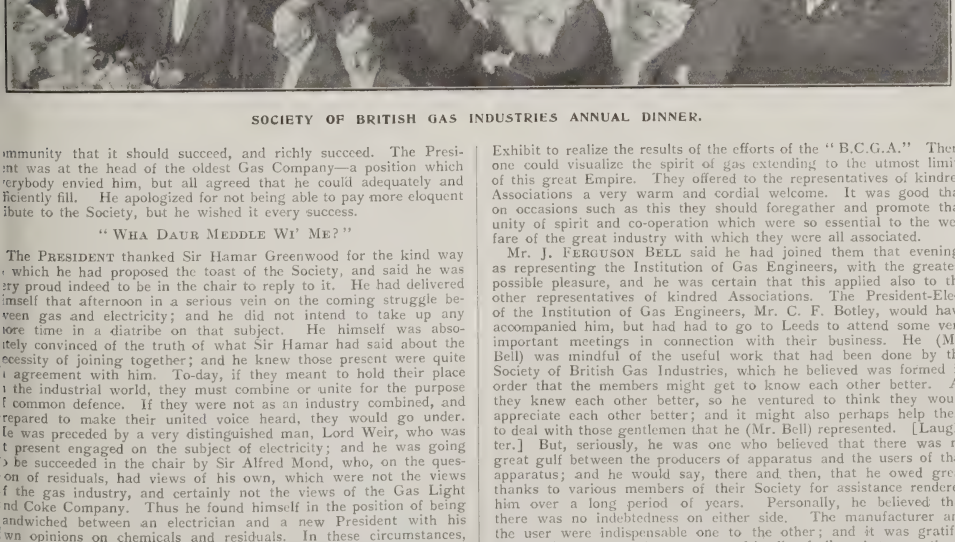
r."] This was a great compliment to the originality, and more ticularly to the tenacity, of the people of our race.

UNITY IS STRENGTH.

y had now organized themselves into a Society, and he would to say just a word or two on this. He did not believe it was sible in this modern world—with industrial competition growing r more fierce—for any industry, or group of industries, like theirs, nany different kinds, to exist unless they united, and had a com- n purse, with a common object, to fight common competitors out- e their realm. He thought, therefore, they were wise to unite ether as they had done; and if he had his way, he would have industries in this country united in a similar manner. He had ently returned from another great industrial country, Germany. would be an impertinence for him to quote his opinion against se of the great bankers and the great industrialists; but he was ng to do it. He believed that Germany was working to-day h a zeal, with an energy, with a cohesion, and with an intelligence t in five years—no longer—would again place her at the very top the commercial interests of Europe; and not only this, but would ain make her the predominant military power. Those who sat e in wonderful, splendid, lovely England seemed to be more on defensive than were the people in that great competitive Ger- ny; and in this rough world of economics, it was not because a ntry was beautiful or the people lovable that they would neces- ily succeed. They were faced at this moment with competition m Germany which he did not believe one man or woman in a ndred realized. The members of that Society at least were wise, d were doing what they could in every way to meet what he thought uld be the severest competition that would come from Germany, d which had already started to come. He would couple with toast the name of the President who was just retiring. Mr. lne Watson represented a Company who all through their long reer had stood, as he (the speaker) thought, for the best interests the community they had so faithfully served. One of the prejudices y must all try to break-down was that the success of a gas or ilar company meant that it was militating against the welfare the community. On the contrary, it was in the interests of the spirit, they could meet together, and President could succeed President, all working as they believed for the good of the nation generally. For his own part, he could assure them that he had been very proud indeed to be President of the Society. No duty had been more pleasant; and no time had passed more quickly. He had in his own work been helped very largely by their advice and by their support; and he hoped that after his retirement from the chair they would always allow him to remain with them in sentiment and in feeling.

Before sitting down, the President announced the receipt from the Lord Mayor of Manchester (Alderman Fred. J. West) of a telegram expressing regret at his inability to be present owing to a special Council meeting, and sending best wishes and greetings.

Mr. B. B. WALLER submitted the toast of "Kindred Associations;" remarking that it was very gratifying indeed to the Society to have so many representatives of other organizations with them that evening. It indicated the existence of that spirit of good fellowship which was so essential to their general welfare. It was not his intention to enlarge on the activities of these various Associations. The good work they were doing was well known to all of those present, and was very highly appreciated. He was pleased to know that they had with them, as representing the parent body, Mr. J. Ferguson Bell, the President of the Institution of Gas Engineers, and Presidents, &c., of different District Associations, representing that great body of gas engineers who were ever pressing the members of the Society for plant of increasing capacity to meet their growing needs. Then they had with them their esteemed President, as representative of the National Gas Council. One need be only a very minor member of that body—as he (Mr. Waller) himself was—to realize the extraordinary amount of useful work that was being carried out by them. Then, again, there was the child of prodigious growth, with the insatiable appetite, who was always asking for more—the British Commercial Gas Association. The "B.C.G.A." had been well represented there that evening by their old friend Mr. F. W. Goodenough, who, by the way, he was sorry to say, had been obliged by indisposition to leave them. Mr. Goodenough's name was synonymous with great achievements. One had only to go to Wembley and see that great Gas



SOCIETY OF BRITISH GAS INDUSTRIES ANNUAL DINNER.

mmunity that it should succeed, and richly succeed. The Presi- nt was at the head of the oldest Gas Company—a position which erybody envied him, but all agreed that he could adequately and ficiently fill. He apologized for not being able to pay more eloquent ibute to the Society, but he wished it every success.

"WHA DAUR MEDDLE WI' ME?"

The PRESIDENT thanked Sir Hamar Greenwood for the kind way which he had proposed the toast of the Society, and said he was ry proud indeed to be in the chair to reply to it. He had delivered imself that afternoon in a serious vein on the coming struggle be- veen gas and electricity; and he did not intend to take up any ore time in a diatribe on that subject. He himself was abso- tely convinced of the truth of what Sir Hamar had said about the ecessity of joining together; and he knew those present were quite agreement with him. To-day, if they meant to hold their place the industrial world, they must combine or unite for the purpose f common defence. If they were not as an industry combined, and repared to make their united voice heard, they would go under. le was preceded by a very distinguished man, Lord Weir, who was t present engaged on the subject of electricity; and he was going be succeeded in the chair by Sir Alfred Mond, who, on the ques- on of residuals, had views of his own, which were not the views f the gas industry, and certainly not the views of the Gas Light nd Coke Company. Thus he found himself in the position of being andwiched between an electrician and a new President with his wn opinions on chemicals and residuals. In these circumstances, e would suggest, as a suitable motto for the gas industry: "I'm ee Jockie Elliot; Wha daur meddle wi' me?" After all, there as no doubt that the fact that they in this country did not always et on very well together led partly to the strengthening of the ational character. They knew how to fight and how to be friends; nd although they had differences, they still remained friends. It as one of the characteristics of the British nation that they knew ow to fight and how to remain friends; and though they might iffer on certain questions, yet at the same time there was a friendly Exhibit to realize the results of the efforts of the "B.C.G.A." There one could visualize the spirit of gas extending to the utmost limits of this great Empire. They offered to the representatives of kindred Associations a very warm and cordial welcome. It was good that on occasions such as this they should foregather and promote that unity of spirit and co-operation which were so essential to the welfare of the great industry with which they were all associated.

Mr. J. FERGUSON BELL said he had joined them that evening, as representing the Institution of Gas Engineers, with the greatest possible pleasure, and he was certain that this applied also to the other representatives of kindred Associations. The President-Elect of the Institution of Gas Engineers, Mr. C. F. Botley, would have accompanied him, but had had to go to Leeds to attend some very important meetings in connection with their business. He (Mr. Bell) was mindful of the useful work that had been done by the Society of British Gas Industries, which he believed was formed in order that the members might get to know each other better. As they knew each other better, so he ventured to think they would appreciate each other better; and it might also perhaps help them to deal with those gentlemen that he (Mr. Bell) represented. [Laughter.] But, seriously, he was one who believed that there was no great gulf between the producers of apparatus and the users of that apparatus; and he would say, there and then, that he owed great thanks to various members of their Society for assistance rendered him over a long period of years. Personally, he believed that there was no indebtedness on either side. The manufacturer and the user were indispensable one to the other; and it was gratifying to know that there was a friendly feeling between them. He thought, speaking for himself, that the Society of British Gas Industries and the Institution of Gas Engineers might become more closely associated with advantage to both. ["Hear, hear."] An interchange of views must be always beneficial. Of course, when the makers of apparatus placed their views before gas engineers, the latter did not always agree with them. In fact, they sometimes thought the makers took a limited view of things, especially in the matter of prices. [Laughter.] But the makers might

also think that the engineers took a limited view of the position; and so it was well that they should know each other, and that they should be able to realize the difficulties each had, and their limitations. The material welfare of this country was very closely bound up with the engineering and chemical industries; and anything that could be done to promote the interests of these two great branches was to the benefit of the community at large. Therefore he was glad to be with them, to say how much gas engineers appreciated the efforts the Society were making. Unity was strength; and the members were wise to combine together to make productive efforts.

THE PROBLEM OF TO-DAY.

English manufacturers for too long a period had been dissociated; but now they had come together, and there was no reason why they should not help one another, as gas engineers did—though, of course, there was no rivalry as far as gas makers were concerned, except rivalry in giving the best service they could to the community. There was no doubt that what they were all suffering from at the present time was the acute unemployment question, which was possibly the most difficult problem they had to deal with to-day. On his way up to town that day, it had been with the greatest possible pleasure he had read a leading article in "The Times" with reference to the proposals of the President-Elect for dealing with this labour question. Sir Alfred Mond had put forward what he (Mr. Bell) ventured to think was a statesmanlike view of the situation. ["Hear, hear."] He hoped the Government would give very serious consideration to the question of subsidized wages. As "The Times" pointed out, Sir Alfred Mond had performed a valuable public service. The obvious advantages of maintenance with work, as against maintenance without work, must be recognized by all parties. It was easy to criticize; but he hoped the politicians, instead of looking for difficulties, would give the proposal a fair trial, and see what could be done. Everyone must realize that the dole was demoralizing to the manhood of the country, and was making men work-shy. The question of unemployment was one that the manufacturers had got to meet in some way; and to do so they would have to produce goods at such a price as potential buyers could pay, and as would enable them to hold their own against Continental and other competition. Sir Hamar Greenwood had pointed out that they would have to meet more severe competition in the future than in the past; and he felt quite certain that what he had said with reference to Germany was true. It must be realized that, now the war was over, this country was poorer, and the people would therefore have to work harder in the future than in the past. What was necessary was a drastic curtailment of expenditure. Certain trades and industries were being taxed, Imperially and locally, out of existence. Costs must be cut-down, so that they could hold their own with competitors. The gas industry feared no competition, so long as that competition was fair; and he did hope that those gentlemen who were prominent in Parliament would see that gas, as an industry, had a fair field—which was all they asked for. They did not want any favours.

PRESIDENT-ELECT'S INDUSTRIAL "MEDICINE."

Mr. FREDERICK C. TILLEY proposed "The New President," and said that Sir Alfred Mond did not need any introduction to them. He was so well known throughout the whole world that they did not need to be told who or what he was. They welcomed him heartily, and thanked him for becoming their President. ["Hear, hear."] During the life of the Society, they had had many illustrious men as President—great engineers, great industrialists, representatives of the law, and of medicine—and now they could congratulate themselves, when they considered the record of Sir Alfred Mond, that in him they had a President who combined the whole of these qualifications, with the exception, perhaps, of that of medicine. He did not think he had taken any part in medicine of the usual kind; but he had during the last few months endeavoured to introduce "medicine" to the industrial world, in the shape of a very daring scheme for improving the lot of everyone in the country. The proposal Sir Alfred had brought forward was one which he hoped would have very speedy attention, because something of the kind had certainly to be undertaken to bring about the necessary change in existing industrial conditions. He hoped it would be possible to give the scheme a trial; and Sir Alfred Mond was heartily to be thanked for bringing it forward at a time when it was evident that something must be done to cope with this urgent and difficult problem. He was sure they had only to look to their new President for guidance, and they would receive it, and would be proud to receive it, from one who was so eminently well qualified to give it.

The Right Hon. Sir ALFRED MOND, Bart., M.P., thanked Mr. Tilley for what he had said, and also his old friend and colleague Sir Hamar Greenwood for his kind words. He and Sir Hamar had worked together under conditions of great strain and difficulty—and when the latter occupied a position, not only of great responsibility, but of great personal risk, in being Chief Secretary of State for Ireland; a position in which he showed that determination and that great courage for which he had always been distinguished. He also wished to thank Mr. Ferguson Bell for his sympathetic allusion to the scheme which he (the speaker) had put forward after much consideration for dealing with the problem of unemployment. It would take up too much time, and it was scarcely the opportunity for him to go into the scheme in any detail; but he would just like to say that he was quite convinced the country could not afford to go on sitting still and doing nothing. ["Hear, hear."]

HELP FOR BRITISH INDUSTRY.

He, like many others, had been hoping against hope that trade would resume its normal conditions, and that no extraordinary measures would be required to get them back to the position in which unemployment would be once more reduced to manageable proportions. Anybody who looked into the matter must have realized that year after year the unemployment figures of this country remained of an alarming magnitude. Anyone engaged in industry must have felt that there was being deteriorated month by month, week by week, and day by day, the material on which they would have to rely if industry was to improve. The fundamental questions were: Could they afford to take the risk of being unorthodox, and to adopt a scheme which might or might not produce inequalities between one firm and another; or could they afford to allow things to go on as they were to-day? Could they afford to see their human material deteriorate? Could they afford to allow a whole generation of young people to grow up who had not known what work was since the war—people who, if they went on much longer as they were going on now, would never be of any use for work, and would remain a burden on the community for life? The question of which method would be the best to adopt, needed discussing. If anyone had a better plan than his, he would not wish to stand in the way; but nobody up to now had produced a better method. They had to struggle to-day in the markets of the world, with great handicaps. He was not concerned with which firm here got an order; but he was concerned that somebody in this country secured it, and not somebody in another country. ["Hear, hear."] His scheme would help in many directions those who were engaged in industries such as were represented there that evening. The firm he was connected with, who specialized to some extent in large gasholders, had, he was glad to say, a very good order for Montreal, and were engaged on similar business in Toronto. He was pleased, when over there recently, to hear how anxious they were to have British goods. Such work was of great value to this country; and he was certain there was more business of a like kind going in various parts of the world. A scheme like his would enable them to take business they could not get otherwise, and help them to employ again people who otherwise had to walk the streets. They were not working for profits now; most of them were only too glad to cover charges. These were the basic factors which had to be considered; and it was useless to put before him all kinds of hypothetical difficulties regarding his scheme, which he could not possibly solve without an opportunity of trying it. If it did not succeed, then they could stop it. He believed there would be sufficient patriotism and common-sense to enable them to get together and allocate work fairly. They would all be only too glad to work together to see British industry once more placed on a sound basis.

AN APPEAL.

This was the spirit which had animated him in bringing his scheme forward; and he hoped all those who sympathized with him would help him in what was a very difficult task. ["Hear, hear."] There were a great many men who thought that criticism was the only way of assisting; it was not. It was so very easy to criticize; it was so very difficult to construct. He was glad to hear that gas engineers thought they and the members of the Society saw each other too little. He had always thought this himself. Anything he could do to help the Society during his year of office, he would be only too pleased to do. Certainly, he could lay no claim to being a "medicine man;" but Mr. Milne Watson had referred to him in several other capacities—with some he was perhaps not so pleased as with others. In some he was a purchaser of Mr. Milne Watson's products; in other ways he might be a competitor with some of the things Mr. Milne Watson's Company produced. But he knew Mr. Milne Watson would much prefer to see synthetic ammonia and sulphate of ammonia made in this country than that it should be made in Germany; and he would agree that his (the speaker's) Company, in undertaking a very large and daring experiment to make this country safe, in case of another war, in the matter of fundamental explosives, had not been actuated entirely by commercial motives, but also by a deep feeling of responsibility towards the country—a responsibility which naturally came to those who were during the last war in the position of supplying 75 p.ct. of the high explosive, ammonium nitrate, to the Allied forces. They felt that never again should this country be placed in the precarious position in which it was at that time. Of course, he hoped incidentally that they would make some money. He was quite sure British engineering and British science and enterprise were superior to anything which Germany had to offer, even in the lines on which they had been at work for many years. There were here plenty of energy, talent, resource, and inventive capacity; this country was inferior to none in the world in these great qualities. He was not gloomy about the future of British industry, and would never believe they could not re-establish that commercial and industrial position they occupied before the war; or that they were, as many people believed, on the down grade. Take the gas industry, it had been declared dead he did not know how many times; but the declaration had always proved quite untrue. There was more gas sold now than ever before, and the industry would continue to grow in various directions and to improve its processes. He himself had been interested in cheap power for many years; and he had not finished with it yet. They were only waiting for someone to do for gas what the turbine had done for steam, for the swing to be in the other direction.

GAS THE GREATEST SERVANT OF THE PUBLIC.

Sir ARTHUR DUCKHAM, K.C.B., said the honour had been conferred upon him of welcoming their visitors. He had been given a list; but when he read it, he found that the greater number were not really visitors, but were just friends who had come in to join them. The greater part were members of the gas industry; but on rising to propose the toast of "The Visitors," he would wish to welcome the others to a body which was part of a large body that constituted the greatest servant of the public in existence to-day. The industry's work and prosperity were entirely based on service to the public; and he had no hesitation whatever in claiming that the industry was the greatest servant of the public to-day. Just consider what gas meant in the household, in the life of the housewife—how it was lightening the burden in these strenuous times of lack of domestic service. The gas cooker, the gas fire, the gas water heater, and gas-lighting, had made domestic service entirely different; and to-day a situation had been reached in which householders did not at all mind being left without domestics, because they could do the job themselves. To carry the matter further, there was the great service of smoke abatement, in which the gas industry was the chief mover. Smoke had been a disgrace to the country for very many years; and the gas people were those to cure it. It was not super-

tricity stations that were going to do this. The gas industry the one great factor in smoke abatement in this country, and ould continue to be the main factor, by the provision of smokeless , either gaseous or solid. In an amazing speech in the House Commons, the Secretary for Mines had stated that the only hope the Government had in the coal position was the introduction ow-temperature carbonization. When they read this, they must e felt that, even if low-temperature carbonization was right, it st be the gas industry which would have to carry it out, because : was the only industry that could properly handle the busi- s. Going on still further, there was the question of the use gas for industrial purposes. So far they were only touching the ge of what could be done in this direction; but the gas industry ld offer service in this direction which was becoming appreciated re and more day by day. When in America recently, he was ner amazed, while discussing gas and electricity, to be told that gas industry there was going ahead more rapidly than the electri- industry. Gas had a service to render which the electrical industry ld never fulfil. He was entirely of the opinion that the gas in- try had nothing to fear from competition so long as it was fair. ey were not very frightened of the electricity scheme; what they fear was its becoming a burden on the country. The gas industry s one of the principal rate and tax payers of the country; and they re frightened of the possible effect of the scheme on their industry this way, and in this way only. He coupled with the toast the ne of Mr. Hardie, and he would like to say on behalf of the iety that Mr. Hardie was the sort of gas engineer they liked. He was of absolute integrity; he was always willing to see one; and from him they at all times got fair dealing. [Applause.]

THE GAS INDUSTRY'S SUCCESS.

Mr. THOMAS HARDIE, in response, said the visitors appreciated very much the cordial way in which they had been welcomed. The President in his address had dealt with the subject of competition by electricity, and had given to those who were favouring subsidies some good food for thought; but Sir Arthur was right—that gas was not afraid of fair competition. Gas had been in existence over a century; and it was more than fifty years since electrical competition was first put forward to frighten them. At that time it was thought that the uses of gas would be very quickly taken up by electricity; but instead of this, every year increased uses for gas had been found, and to-day there was every bit as much scope for an increase in consumption as was the case fifty years ago. This was shown by the extraordinary growth of demand, even in these years of depression. No other industry had gone ahead at such a speed during the last few years. The gas industry knew it was offering a service which the people wanted; and it did not require to be assisted by subsidies or any other means. The increase in the number of gas-consuming appliances in London alone amounted to thousands weekly; and from this cause arose the increased consumption. This growth in business would continue so long as the industry continued to give a service that the public required. He always enjoyed being the guest of the Society. There was invariably something to learn, and it was very pleasant to meet them all in these happy gatherings.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

MEETING AT HARROGATE.

THE 201st Quarterly General Meeting of the Institution took place last Friday at the Harlow Manor Hydro, Harrogate, when there was an attendance of about 130. The proceedings opened by luncheon, at which the members and visitors were the guests of the Harrogate Gas Company.

LUNCHEON.

Mr. Francis Barber (Chairman of the Harrogate Gas Company) presided at the luncheon, and was supported by, among hers, Sir Dugald Clerk, K.B.E., F.R.S. (Past-President of Institution of Gas Engineers), Mr. J. H. Ellis (President the British Commercial Gas Association), Mr. F. H. Robin- n (Engineer and Manager of the Harrogate Gas Company, d President of the Manchester Institution), Mr. C. S. Shapley eeds City Gas Engineer, and Vice-President of the Man- ester Institution), Mr. W. B. M'Lusky (Halifax Borough Gas gineer), Mr. Harold E. Copp (Hull), and Mr. W. M. Mason anager of the "B.C.G.A.").

Mr. FRANCIS BARBER, proposing the toast of "The Guests," said Company regarded it as a very great privilege to be able to in- e the members of the Institution to their town—especially so in w of the Institution having graced the Company by the appoint- nt of their Engineer and Manager (Mr. F. H. Robinson) as Presi- nt. Directors of companies realized fully what really important ividuals were the engineers dealing with their great industry; and believed the confidence directors placed in their managers and gineers was very well merited. Institutions of that kind took a y important part in the development of ideas; and he thought whole industry recognized that, of all the scientific minds in the untry, that of Sir Dugald Clerk had probably been among the most pful. ["Hear, hear."] He would like to offer the congratula- ns of the gathering to Sir Dugald Clerk on his recent honour by ng awarded the Medal of the Royal Society. They would all be ighted if Sir Dugald was in a position to let them know something the secrets of some of the recent wonderful results of research at eenwich, of which they had heard lately.

Sir DUGALD CLERK, responding, said on occasions of that kind hnical people did not care much to go into technics; but as Mr. rber had specifically put one point to him with regard to low- nperature carbonization, it would be a breach of his duty if he d not attempt at least a short answer. This question of low- nperature carbonization had been very much in all their minds for ne time; and they were told that the future safety of the country pended on success in that matter. This information was given, he ared, by gentlemen connected with politics who were glad to get ne sort of cry to take to their constituencies. There had always en in politics the need of a campaigning cry to put before the blic. Low-temperature carbonization was just now such a cry.

SUPER-POWER ELECTRICITY STATIONS.

other was that of the super-power electric stations. The elec- cal people were quite good friends of theirs; and the only objec- n he had to their criticisms was when, instead of being criticisms ainst the science of the gas industry, they became personal abuse. he noticed had happened lately in one case in regard to himself. me time ago he offered to discuss matters amicably with the elec- cal people on the floor of their own Institution of Electrical ngineers; the understanding being that if either side was proved rong in their contentions, they would candidly admit it. The esident of the Institution of Electrical Engineers called a meeting r the purpose, and they had a very amicable discussion on the ques- n of whether some of the electrical people's statements as to the lative efficiencies of gas and electricity were misleading to the blic. At the conclusion, the electrical people present accepted his ir Dugald's) arguments without question. Now, however, the ctrical journals were wakening-up to the attack. One had gone so r as to offer rewards to anybody who could show that electrical ergy was not as efficient for cooking and heating as was gas. The urnal, of course, was hopelessly out of it; and the thing only showed how little the writers knew of their business. The electrical engineer of a large city had openly objected to Mr. Baldwin's statement that electricity was enormously too expensive, and that the country would be saved only by getting rivers of electricity and selling it at practically nothing. This gentleman said: "Suppose you put up all the stations that are spoken of, you would not reduce the cost of electricity by one penny." "We know perfectly well," said Sir Dugald Clerk, "that electrical engineers have come pretty near the limit." Sir Dugald referred to a paper which he read some years ago before the North-Eastern Institution of Engineers, when figures were given by himself and by Sir Charles Parsons on the limits of the steam turbine and gas engine. Parsons had said that with steam at 400 lbs. per sq. in., superheated, &c., the maximum efficiency they could hope for was 28 p.ct.; and this was a very high percentage. On a similar comparison as to what gas could do in high-compression engines, his (Sir Dugald's) maximum figure was 46 p.ct.; and, as a matter of fact, in some recent engines that had been built in the North by Beardmore's, they had actually succeeded in getting 40 p.ct. So it was evident the figure was not so far out. Parsons' figures would mean a possible 20 or 21 p.ct. of energy of the coal transferred into current sent out of the station; and one Manchester station of fairly recent construction was doing 20'33 p.ct. "No matter how many super-power electricity stations you put up," said Sir Dugald, "you cannot get 24 p.ct.; and yet we are talking of rivers of electricity at an incredible price!"

LOW-TEMPERATURE CARBONIZATION.

Turning to the subject of low-temperature carbonization, this first appeared about 1906. "My friend the late Sir George Beilby—a very good friend to the gas industry—talked to me when this Greenwich station was started, and asked me to inspect the place; for he felt that the question of low-temperature carbonization should be investigated. Sir George investigated it very carefully; and his view was that, unless you could sell the so-called smokeless fuel produced by this process at an easier rate per ton than the original price of the coal, you could not make the concern pay. That is a fatal objection from our point of view. I have been approached by Government officials, and have investigated the process to which Mr. Barber referred just now; and the results will shortly be published in a report. I can hardly say more on that point at the present moment. On the commercial side, I do not see any real improvement. The great fault is due to this: To take equally good coal, distilled in the low-temperature way, you only get about 5000 c.ft. of gas. Most of the schemes burn that gas to heat their low-temperature retorts. That is idiotic. [Laughter.] I pointed out to the Government people that the most valuable product in gas production is the gas. If you throw away the other things, you cannot expect it to be a commercial success. You must first get the gas right. So far as the oils and tars of low-temperature carbonization are concerned, it was agreed that the products were not so valuable as from high-temperature carbonization. I pointed out that, if the Government desired to get oil for the Navy independent of outside sources, as we all agree is quite desirable, if you can imagine the whole of the 35 or 36 million tons per annum in Great Britain (I think 36 million is the figure stated, but I have recently found it is only 35 million) being put through low-temperature carbonization, and take the latest yield of oil by the most approved process, you would have about one-third of the amount required by the ships of the British Navy using steam power. If we had all the Navy using internal combustion engines, we should just be able to keep our ships going by the oil got by that low-temperature carbonization. If the Government approach this matter from that point of view, it is quite legitimate for the Fuel Station to continue experimenting. I do not expect they would attain commercial success; but they may get a knowledge which will enable us, in case of war, to feed our ships with oil—a course of which we all fully approve."

Mr. J. H. Ellis, submitting "The Institution of Gas Engineers," said it was a great pleasure to him to propose a toast to an organization to which all placed as he was—as Chairman and Managing Director of a large gas undertaking—owed so much. He doubted whether there was any institution in the country so full of good fellowship, sound knowledge, and business ability as the Institution of Gas Engineers; and he doubted whether there was any endowed with such a high sense of public duty and responsibility. They would not expect him, following Sir Dugald Clerk, to deal with matters from the technical side; but he might be able to say something of them as they presented themselves to him as a man of business. Most Yorkshiremen knew Mr. Lane Fox, the present Minister of Mines, as a great Yorkshireman, a great landed proprietor, and a good sportsman. They were glad to hear him in those capacities; but his sentiments on the subject of low-temperature carbonization he (Mr. Ellis) ventured to say were entirely wrong. They had just heard what Sir Dugald Clerk had said as to its likelihood of being a commercial success. Yet Mr. Lane Fox, in the House of Commons recently, said: "The Government were going to spare neither money nor energy to make this process a commercial success." That was absolutely unfair, improper, and uneconomic. ["Hear, hear."] Yet it came from the mouth of a Conservative Minister. "I know something, second-hand, perhaps, about low-temperature carbonization," said Mr. Ellis. "Let me draw attention to what a man highly respected in the North for his knowledge and his position said in a letter to 'The Times'—a letter written long before Mr. Lane Fox's utterance. Lord Gainford stated therein: 'It is now over twenty years since this process was first brought to the notice of the public.' It has been investigated, experimented upon, modified, and transformed in at least fifty varieties of ways. The highest technical skill has been exercised upon it; laboratories have been devoted to the most elaborate researches into the possibilities of its development. Over £1,000,000 has been expended in the effort to give this phantom a body and a shape; and yet we have found no convincing solution of the problem which surrounds it.'" With that warning before him, said Mr. Ellis, Mr. Lane Fox stated that "the Government are going to spare neither money nor energy to make this process a commercial success." It was objectionable on business grounds. Several years ago his Company at Plymouth tried this process under its then name of "Coalite." A free hand was given for the trial; and the experimenters cleared out because it did not pay. The resulting product of fuel, which was to be smokeless, would not burn. That was the experience twenty years ago. He quite agreed that one failure was not sufficient for engineers to accept as final. They no doubt wanted to try it themselves; probably a good many present had tried it. He knew that some people, at any rate, had given the low-temperature carbonization people an opportunity to see if they could make a success of it. He knew this because some little time ago there was a paragraph in the papers that Nottingham had actually made a success of it. A friend of his came to him for information and guidance, thinking he would like to put some money in it. He told him to come back in a week. Meanwhile, he made inquiries. When the friend came back, and still seemed interested, in spite of the result of the inquiries, he told him to go and see the works at Nottingham, but he fancied he would find they were not there. He made further inquiries at Nottingham, when he heard the Government were going to take this thing over, and was informed that not a brick had been laid. In the Technical Press recently he read a paragraph reporting a claim before Mr. Justice Greer, in the King's Bench Division, against Low-Temperature Carbonization, Ltd., for compensation in default of erection of their plant; and judgment was given for the amount claimed, with costs. This was the latest information that he had as to low-temperature carbonization. [Laughter.]

THE ELECTRICITY SUBSIDY QUESTION.

Passing to the commercial aspect of the electricity subsidy question, Mr. Ellis quoted from the "Yorkshire Post" of that day a letter by Mr. C. Nelson Hefford (the City Electrical Engineer of Leeds)—a letter which was so full of sound sense and fact that he readily adopted it. It was addressed from the Whitehall Road Works, Leeds. Mr. Ellis said he only hoped the knowledge at Whitehall Road, Leeds, would extend to Whitehall, London. [Laughter.] The letter was a long one, but very sound, and in conclusion summed-up the matter as follows: "Electric current is to-day generated almost as cheaply as existing knowledge and existing economic conditions permit. In the industrial North, at any rate, the pressure of circumstances is automatically resulting in interchange and co-operation between the larger producers. Politicians should beware lest, even with the best intentions, they retard rather than advance progress." Mr. Hefford was evidently man enough to say, "I will fight my competitors unfettered," and they of the gas industry said the same. ["Hear, hear."] Frankly, he distrusted the Government—not in a political sense, but in dealing with matters of this kind, because of lack of knowledge, because of the economic position, because of the danger of unfairness in other directions.

Mr. Charles Wood, responding to the toast in the unavoidable absence of Mr. J. Ferguson Bell, said they had listened to two excellent addresses by Sir Dugald Clerk and Mr. Ellis. He was sure what the speakers had said was most important at the present time; and the information they had given would have a very good effect on all of them. Mr. Wood remarked that he himself had been a member of the Institution of Gas Engineers almost more years than he cared to remember, and he had been a member of the Manchester Institution even longer. He believed he was the fourth or fifth oldest member of the Manchester District to-day.

Mr. C. S. Shapley, proposing "The Chairman and Directors of the Harrogate Gas Company," expressed the warm thanks of all for the hospitality received, and to Mr. Robinson for the trouble he had been to in making the arrangements for the visit. Mr. Shapley said he was sure the members would find a great deal to interest them at the Harrogate Gas-Works, where Mr. Robinson had a good many rather novel ideas in operation. With regard to the letter by the Leeds Electrical Engineer, Mr. Hefford was "a jolly good electrical engineer, and a clean fighter." There were few better electricity works than those at Whitehall Road, wh they were producing electricity at an average selling price of 1·5 The gas undertaking was "up against it;" but it stiffened it backs, and would do good. But it was grossly unfair that, app ently, they were not to come in for a bit of the spoil from the G ernment which was to be given to the electrical people. The industry was supposed to have done yeoman service in the war; it seemed now as though the electricity industry was to be ass by the State, and the gas industry was to be left to plough lonely furrow.

Mr. F. Barber, responding, said he was glad such tribute been paid to Mr. Robinson. It was really more an honour to Robinson than to the Company that the members had come to H rogate that day. It was the Company's esteem for their Engi who was the Institution's President, that had induced the Direct to support the high honour the Institution had done him; and t were glad to be able to show their appreciation. Mr. Robinson appointed eleven years ago; and their selection of him had more than justified by the results to the Company during this pe and now by the honour brought to them through his electio President of the Institution.

Mr. F. H. Robinson expressed his appreciation of the kind th that had been said about him.

THE BUSINESS MEETING.

At the business meeting, which was held in the ballroom the Hydro, the members were briefly and formally welco by Mr. Barber. Mr. Robinson was in the chair.

Mr. Mason, by special permission, shortly outlined the nat of the new Wembley Gas Exhibit, its aims, and the indust hopes of it; stating that it was even better than last year, backed by still better publicity, and was the centre of very g hopes for what it could do in showing the world all that could accomplish for industry and for the home. He ur support of the exhibit on the part of any gas undertaki which had not yet given that support. Referring to extr gant and unjustified claims for electricity, Mr. Mason some people thought the "B.C.G.A." ought to rush into p to controvert all the misleading statements which appea but it had been found to be by far the better way not to e into controversy, but to concentrate on widespread publi of the capacities of their own product, gas. The way to business was to concentrate on that business, rather tha conduct newspaper controversy for the public amusement.

On the motion of the President, the meeting passed a r lution of condolence with the relatives of the late Mr. E Brockway, of Cleethorpes.

Mr. W. B. M'Lusky (Halifax) then opened a discussion the following subject:

SPECIFICATIONS FOR INTERNAL FITTINGS.

The Halifax specification is as follows:

SPECIFICATION AS TO THE CONSTRUCTION AND PLACING INTERNAL PIPES, METERS, AND FITTINGS.

Sections 36 and 37 of the Halifax Corporation Act, 1 read:

As to Construction and Placing of Pipes, &c., Betwee Mains and Meters.

36. In order to enable the Corporation to ensure a satisfa supply of gas to their consumers, the following provisions shall effect:—

(1) The Corporation may specify the size and material of the with the fittings thereof which are to be laid by the cons *on his own premises* either in the first instance or on the sion of any renewal between the Corporation's mains and meter so far as such pipes and fittings are intended to be co over.

(2) The Corporation may, if they think fit, make different spec tions for different classes of premises, having regard to probable maximum consumption of gas thereon at any one

(3) The specification shall be published once in each of two papers circulating within the limits of supply, and a copy th shall be kept exhibited in the office of the Corporation.

(4) Every meter to be used in a new building or a building previously supplied with gas, or in connection with a ne substituted pipe laid by the consumer between the main an consumer's meter, shall be placed as near as reasonably pra able to the Corporation's main, but within the outside wa the building.

(5) When any such pipe or meter as aforesaid has been laid or pl notice thereof shall be given to the Corporation, and the shall not be covered over until the expiration of twenty hours from the service of such notice on the Corporation. officer of the Corporation duly appointed may between o'clock in the morning and five o'clock in the afternoon a and inspect such pipes with their fittings and meter; and i officer is not permitted to make the inspection, or if the or fittings are not according to the Corporation's specifica or if the meter is not placed as required by this section Corporation may refuse to supply gas to the premises until provisions of this section have been complied with.

(6) Any person to whom the Corporation refuses a supply of under the provisions of this section may appeal to a sessional court against such refusal, and the court may, hearing the parties and considering any questions as to reasonableness of the Corporation's specification, make order as seems to them proper in the circumstances, and

order by which of the parties the costs of and incident to the appeal shall be paid.

GAS CONSUMERS TO GIVE NOTICE TO CORPORATION BEFORE REMOVING.

At least twenty-four hours' notice shall be given to the Corporation by every gas consumer, either personally at the office of the Corporation or in writing, before he shall quit any premises supplied with gas by meter by the Corporation, and in default of such notice the consumer so quitting shall be liable to pay to the Corporation the money accruing due in respect of such supply up to the next usual period for ascertaining the register of the meter on the premises or the date from which any subsequent occupier of the premises shall require the Corporation to supply gas to such premises, whichever shall first occur. Notice of the effect of this requirement shall be endorsed upon every demand note for gas charges payable to the Corporation.

Length of Service Provided Free.—A service pipe will be laid from any existing main to the boundary of any private property on request free of charge, provided the length of service pipe required is not greater than 30 ft. Any additional length of pipe required to reach the boundary, and all piping laid in private property, will be charged to the consumer or owner of the property, as the case may be. No gas piping must be built in.

Lead Pipes and Connections to Inlet and Outlet of Meter.—A soft lead pipe connection between the end of the iron service pipe and the inlet to the gas meter must not be less than 12 in. or more than 36 in. in length. No outlet pipe from the meter—however small—must be less than $\frac{3}{4}$-in. internal diameter. Union joints, whether on the main tap or on the outlet of the meter, must not be "bull-nosed" or "branched" on the side, but must be joined to the end of the pipe. In cases where lead connections are to be made to wrought-iron piping, a brass union and tailpiece must be used.

Application for a Supply of Gas.—Application for a supply of gas, whether in respect of premises not supplied previously or in case of change of tenancy, must be made at the Gas Showrooms, Waterhouse Street, Halifax, or at the Borough Treasurer's Office, Town Hall, Halifax, when, subject to the regulations in respect to deposits and the requirements of the Corporation as to the soundness and suitability of the pipes and fittings within the premises, the supply will be given.

Fitter.—All gasfitting work should be done by an experienced gasfitter (hereinafter described as the fitter).

Maximum Number of Burners and Appliances.—Before commencing any gasfitting work, the fitter must give notice to the Gas Engineer of the number of lights and/or gas appliances intended to be fixed.

Inspection and Testing of Gasfitting Work and Tenants' Fittings.—The service pipe will then be laid and the meter fixed; but the gas supply will not be turned on at the meter by the fitter until the fitter has personally examined the pipes and fittings and satisfied himself that the work is sound in every respect, and in accordance with the regulations of the Corporation. He must then intimate to the Gas Engineer (on a form provided for the purpose) that the work is ready for testing, whereupon the pipes and fittings will be examined by the Gas Department's inspector (hereinafter described as the Inspector). If the work is found satisfactory, a certificate to that effect will be issued; otherwise the fitter must at once remedy the defects, and, when he has done so, notify the Gas Engineer, who will arrange for a second inspection.

Notification of Additional Lights or Appliances.—If at any time after gas has been supplied to premises it is desired to add, remove, or alter the position of any light, fitting, appliance, or meter, notice of such intention must be given by a fitter to the Gas Engineer at the Gas Showrooms, Waterhouse Street, Halifax, whereupon the premises will be inspected; and if such additions, removals, or alterations are approved, the necessary permission to commence the work will be given with or without conditions attached.

Meters on Sale or Hire.—Meters may be obtained from the Corporation on sale or hire.

Meters to be Tested.—Consumers' own meters, whether new or old, must be sent to the Gas-Works, Mulcture Hall Road, Halifax, for approval before they can be fixed, and each meter when sent must be accompanied by a note giving the full name and address of the owner. Any meter not so approved must not be used.

Secondary Meters.—Meters supplied on hire by the Corporation must be used only for the measurement of the whole supply of gas used. Other meters required by the consumer for the separate measurement of gas used in different parts of the premises are not provided on hire by the Corporation. Schemes and estimates for the sub-division of the gas supply within any premises will, however, be prepared and supplied free, upon application at the Gas Showrooms, Waterhouse Street, Halifax.

Size of Meter.—The size of the meter required at any premises will be determined by the Corporation on the basis of the maximum demand.

Position of Meter.—The meter must be fixed in a level position at a sufficient height from the floor to prevent lodgment of water around it. The position selected should be near the wall abutting on the street in which the gas main is laid, but not near a fireplace or boiler, and not in any position which is inaccessible or dangerous.

Protection of the Meter.—A space of 3 ft. must be provided between gas meters and electricity meters.

Safe Distance Between Gas and Electricity Supplies.—Where gas and electricity supplies are to be used on the same premises, the gas pipes must not be fixed at a less distance than 1 ft. from the electricity wires.

Types of Meters.—Wet meters have been found more suitable in most of the positions in which gas meters are fixed in Halifax; but in dry situations dry meters may be fixed. Such meters, however, must be placed on a shelf or other support provided by the consumer.

NOTE.—In all cases the pipe must be laid with sufficient fall towards the meter.

Meters for Gas Engines and Other Special Purposes.—Specifications and estimates will be furnished on request by the Corporation for meters required for the supply of gas to engines, furnaces, and other special appliances.

Consumers' Governors.—Consumers' governors are recommended. All such governors must be fixed on the outlet of the meter. Where mercurial governors are used, provision must be made to prevent any mercury getting into the meter.

INTERNAL PIPES AND FITTINGS.

Shops, Workshops, Factories, Warehouses, Offices, and Business Premises Generally.—The size of the outlet pipe from the meter will be determined by the maximum demand of the installation.

Residences.—The upright pipe from the floor must in no case be less than $\frac{3}{4}$ in.

2 to 4 rooms	..	$\frac{3}{4}$ in.
5 to 7 ,,	..	1 in.
8 to 12 ,,	..	$1\frac{1}{4}$ in.
13 to 16 ,,	..	$1\frac{1}{2}$ in.

Size of Outlet from Meter.

Wrought-iron pip to be used.

The above dimensions must be adhered to generally, but where a larger supply of gas is necessary, a special specification will be provided by the Corporation. The size of pipe specified above must be carried to the first branch, and from that point forward in accordance with the following Tables.

Table Regulating Size of Branch Pipes and Maximum Number of Burners.

Material.	Size.	Greatest Length Allowed.	Number of Burners.
	In.	Ft.	
Block tin, wrought-iron, lead, or tinned composition.	$\frac{3}{4}$	20	3
		30	6
		40	12
		50	20
	1	70	35
	$1\frac{1}{4}$	100	60
	$1\frac{1}{2}$	150	100
	2	200	200

NOTE.—No pipe of less than $\frac{3}{4}$ in. internal diameter is allowed.

Particulars of pipes required for larger installations will be supplied on application.

Weights of Various Sizes of Interior Piping.—Piping used for gasfitting must be of a quality approved by the Corporation, and of not less than the following weights:

Internal Diameter of Pipe.	Weight per Foot.			
	Block Tin.	Wrought Iron.	Lead.	Tinned Composition.
	Lbs. Oz.		Lbs. Oz.	Lbs. Oz.
2 in.	..	"Gas" strength for internal fittings only.	7 4	7 4
$1\frac{1}{4}$ in.	..		4 $10\frac{1}{2}$	4 $10\frac{1}{2}$
$1\frac{1}{2}$ in.	..		3 5	3 5
1 in.	0 11		2 0	2 0
$\frac{3}{4}$ in.	0 7		1 4	1 4
$\frac{1}{2}$ in.	0 4		0 $14\frac{1}{2}$	0 $14\frac{1}{2}$
$\frac{3}{8}$ in.	0 3		0 $7\frac{1}{2}$	0 $7\frac{1}{2}$

Minimum Internal Diameter of Pipes for Various Purposes.

	In.
For a single or double bracket or pendant	$\frac{3}{8}$
For a bracket or pendants with a continuation for a gas iron or other small gas appliance	$\frac{1}{2}$
For a boiling burner or griller	$\frac{1}{2}$
For a fire in a small or medium-sized room	$\frac{1}{2}$
For a fire in a large room	$\frac{3}{4}$
For a small cooking stove	$\frac{3}{4}$
For an ordinary cooking stove	$\frac{3}{4}$ or more, according to the size of the stove.
For a small washing copper	$\frac{1}{2}$
For geysers and water heaters.	$\frac{3}{8}$ or more, according to the size of the appliance.

NOTE.—When a cooker and a washing copper are taken from the same branch, the branch must be not less than $\frac{3}{4}$ in.

Particulars for gas engines and other larger appliances will be furnished on application.

Fittings for Cooking and Heating Appliances.—Lead or wrought-iron supply pipes must be used for the supply of gas to cooking or heating appliances. The bore of the tap must

be equal to the bore of the pipe. The supply must be taken from a pipe of sufficient size, and direct from the meter outlet if necessary. Brass or copper tubing used in connection with gas fires or for other purposes must be solid drawn.

Anti-Fluctuators to be Attached to Gas Engine Supplies.—In all cases where gas engines are fitted, an efficient anti-fluctuator approved by the Corporation must be fixed.

Self-Acting Syphons Not Allowed.—Self-acting syphons must not be used.

Stopping Pipe-Ends.—Wooden plugs must not be used for stopping pipe-ends.

Joints.—The whole of the fittings and piping must be gas-tight and stand a test of pressure equal to 10 in. water-column for a reasonable time. Rings for making joints must be formed either of asbestos or lead, with flax or hemp and red lead packing. Indiarubber rings must not be used.

Gasfittings.—Pendants must be fixed with a trimmer, bolt, back nut, and elbow union, and with a pattress between the end of the pendant and the ceiling. Connecting bits must not

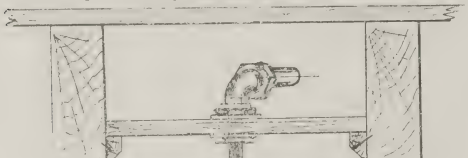


Fig. 1.—Fixing with Trimmer, Bolt, Backnut, and Elbow Union.

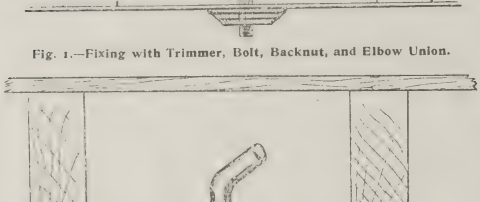


Fig. 2.—Showing Connecting Bit.

be used. The pendant top, pattress, and trimmer must be efficiently screwed together.

NOTE.—Water-sealed gasoliers must not be used. Ball-and-socket joints of the half-ball variety must not be used. All fittings must be produced on demand for inspection and approval by the Corporation.

Side Brackets.—Side brackets must be fitted with brass connecting bits, and fixed on wooden blocks let into the wall.

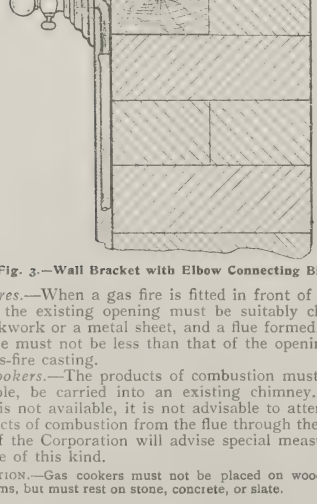


Fig. 3.—Wall Bracket with Elbow Connecting Bit.

Gas Fires.—When a gas fire is fitted in front of an existing fireplace, the existing opening must be suitably closed either with brickwork or a metal sheet, and a flue formed. The area of the flue must not be less than that of the opening provided in the gas-fire casting.

Gas Cookers.—The products of combustion must, if it is at all possible, be carried into an existing chimney. Where a chimney is not available, it is not advisable to attempt to lead the products of combustion from the flue through the wall. The officers of the Corporation will advise special measures to suit every case of this kind.

CAUTION.—Gas cookers must not be placed on wooden floors or platforms, but must rest on stone, concrete, or slate.

Precautions to be Taken in Case of Escapes, &c.—When th odour of gas is first detected, the gas supply must be turne off at once at the main tap *near the meter*, and the window opened at the top and bottom. All fires and lights in the pre mises affected must be extinguished, and no attempt must b made to search for the escape with a naked light. Night call are received at the Gas-Works, Mulcture Hall Road, Halifa (Telephone No. 1485), and prompt attention will be given at al times. The Corporation will not be responsible for any los or damage caused by leakage in internal pipes or fittings.

Unauthorized Persons Not to Interfere With Pipes, Taps, &c —Apart from cases of fire, escape of gas, or other emergency no meter, service pipe, or *service-pipe tap outside any premises* must be interfered with by any person not in the employmen of the Corporation Gas Department.

The above notes were taken as read, but in introducing them Mr. M'Lusky said he had found that the Manchester district was very well in advance of the country generally in this matter. As far back as 1891 the Corporations of Bradford and Burnley had powers to ensure efficiency of gas pipes and fittings, and to prevent accidents. Statements of particulars as to the materials to be employed, the mode of their use or construction, and the soundness of the craftsmen's work when finished, had been provided by gas undertakings in various parts of the country for many years past. One of the best specifications was that of the Manchester Corporation. The work of the Manchester Corporation Distribution Department appeared to be organized right down to the last holdfast. The following sections in the specifications in the hands of the members in print were taken from the Manchester specification: Lead pipes and connections. Position of the meter—with this difference, that in the Halifax section it was provided that the meter should be near, and not against, the wall, as they had had meter cases destroyed by stray currents of electricity earthing between the damp wall and the case of the meter. Weight of pipes. This section was based on the practice in Manchester. Hitherto the weights of lead pipes used in Halifax had been heavier than the lead pipes in Manchester; but, on the other hand, the Halifax weights for tin pipes were less than those of Manchester. Gasfittings and side brackets. Here the particulars were substantially as those of the Manchester Corporation. In all other particulars the specification was the result of his own experience.

For half-a-century or more, he said, the work of internal fitting for gas supply had been conducted in accordance with a well-established rule and practice in the principal towns in this country, at any rate. The Burnley Borough Improvement Act, 1871, gave the Burnley Corporation the following powers: "All pipes and other fittings required for distributing gas or water respectively within any building shall be approved of by and affixed to the satisfaction of, the Corporation or their gas or water manager respectively, before the owner or occupier of such building shall be entitled to a supply of gas or water."

The Oldham Improvement Act, 1880, section 52, provided among other things, that "the Corporation may, if requested by any person supplied or to be supplied by them with water or with gas, furnish to him at his costs and charges, and from time to time fix, repair, alter, or add to, any pipes, valves, meters, &c., . . . or . . . any gasfittings necessary for or connected with such supply, and may provide all materials and do all works necessary or proper in that behalf, or instead of charging the costs thereof to such person may charge such person with such annual or other rent or sum as may be reasonable and agreed on between the Corporation and such person."

The Bradford Water and Improvement Act, 1881, section 45 for ensuring efficient gas and water pipes for houses, stated: "The Corporation may from time to time make and publish such bye-laws as they deem necessary for securing the laying, fixing, and fitting of pipes for the distribution and supply of gas and water by the Corporation at houses and other buildings and places in the borough [Bradford was not at that time a city] in a proper and efficient manner and by competent persons only, and for granting license and authority to such persons for such purpose." The remainder of the section provided penalties to be imposed on persons who acted contrary to the by-laws, or persons not so licensed who fixed, repaired, or altered any pipe or fitting. The Bradford Water-Works and Improvement Act, 1885, section 31, empowered the Corporation to lay and fix service pipes, taps, fittings, junctions, connections, chandeliers, brackets, and the other appliances connected with the supply of gas by the Corporation, at houses and other buildings and places in the borough, and regulated the size and quality thereof.

The Burnley Corporation (Tramways), &c., Act, 1898, provided regulations for preventing the misuse of, and accidents from, gas. Section 35 of that Act read as follows:

"For preventing misuse of gas and for preventing accidents in connection with the supply of gas, the following provisions shall have effect:

"(1) The Corporation may make such regulations as they think necessary for the objects aforesaid to be observed by persons supplied with gas.

"(2) By any such regulations the Corporation may direct the use and prescribe the size, nature, strength, and materials, and the mode of arrangement, alteration, and repair of pipes, valves, meters, and other apparatus to be used by such persons re

spectively for carrying, delivering, and receiving gas, and may interdict any arrangement and the use of any pipe, valve, meter, burner, or other apparatus in their judgment likely to occasion misuse of gas or likely to cause accident.

(3) The Corporation shall not be bound under any agreement or otherwise to supply, or continue to supply, gas to any person unless such regulations as are for the time being in force are duly observed by him."

The Bradford Corporation Act, 1903, section 35, the Perth Corporation Gas Order Confirmation Act, 1906, section 10, the Oldham Corporation Act, 1909, section 70, and the Halifax Corporation Act, 1920, section 36, provided powers to enable the Corporation to ensure a satisfactory supply of gas to the consumers; and with one or two unimportant exceptions, these orders were alike in expression. The more recent Orders omitted the publishing of the specification to one insertion in one newspaper, instead of two insertions as in the earlier orders. Section 5 of the Bradford Order began: "When any such pipes, meter, or fittings as aforesaid." The other Orders referred to omitted the word "fittings" in this part of the section. But the inspection of fittings was provided for in all cases in a later part of the section. Powers or Acts were not lacking; and if any undertaking to-day was short of powers, the remedy was at hand in the Gas Regulation Act.

Mr. M'Lusky said he supposed the discussion that afternoon would probably centre on the need for the better exercise of the powers undertakings already possessed. Time was when excuses could be made for lack of progress in fittings work, or the inspection of fittings; but to-day he thought no fault could be found with the master fitter or his men. They were, a large extent, the agents of the undertakings; and his experience was that they were good agents, and they were always ready to do what was required of them. It was desirable that specifications should conform to an accepted standard. If a specification was good enough for one district, it was good enough for the country, or, at any rate, for an area such as that covered by the Manchester District Institution of Gas Engineers. It was true that practice varied to some extent in different parts of the country. Lead service pipes were used in preference to other materials in parts of the North of England, and in the South-Eastern districts of Scotland. Block tin tube was preferred to tinned composition in many cases, and in Yorkshire ordinary lead pipe was used in preference to wrought iron to a large extent; but a general specification such as that submitted by him that day covered this range. It was a general specification. The working out of the minor details—which were purposely omitted—was better left to the initiative and experience of those who had to do the work, and who knew their own peculiar requirements.

Specifications, after all, did no productive work; but as part of the organization the specification was indispensable. The organization, of course, included the architect first and foremost, the builder, the master fitter, and the gas authority and its administrative and executive staffs. In an organization of that kind the specification became a mere "finger-post" or direction sign—everyone observed it, everyone worked to it, with the result that the architect's schedule of quantities provided a uniform basis of tender, and the architect proceeded with the regularity of a fixed habit. The importance of gasfitting work had probably of late years escaped the notice of the general fitter, the master plumber, the sanitary engineer, and the occasional electrical fitter, who had relegated gasfitting to the position of a mere branch of his general business, and in some cases, he feared, a much neglected branch.

During the past ten years, Mr. M'Lusky concluded, apprentices engaged in such general work had, in many cases, had little or no real gasfitting work in the whole course of their training. This was bad for the craftsman himself, and, if the remedy were not applied, would react on the industry. In Halifax the training of apprentices was one of the responsibilities of the Distribution Superintendent, and the training consisted of the art and craft of meter-making, sheet-metal work, and gasfitting.

Discussion.

Mr. RALPH HALKETT (Sheffield) said his Company at Sheffield had no power to specify pipes, but they did keep in touch with the builders. This had been in operation for some time, and was found to be very beneficial to the Company and to builders alike, because it had helped to get fittings into houses where people would not let them take-up boards and run pipes to instal gas fires. They had only recently adopted prepayment meters in Sheffield, and they specified that certain pipes should be run through. This was absolutely necessary, because they found the difficulty was with old houses. If the plumber thought he would put in a pipe, he sometimes did not mind what sort of pipe it was. The difficulty in these old houses was, therefore, to get sufficient pressure of gas through the pipes previously put in by plumbers. It was certainly a very happy position to be in to be able to specify what pipes should be installed; but he was afraid not many undertakings were in it. Now that they were going to have such keen competition from the electricity people as they had expected, it was up to them all to see that, if they had not powers, they should get into touch with builders and architects, and educate them to the needs of gas service. Another useful channel was that of good relationships with the local plumbers, who also should be educated to the requirements of gas appliances. In regard to service, he noticed Mr. M'Lusky defined 60 ft. free to the boundary. In Sheffield they gave 20 ft. to the mains, no matter what was the position. Mr. M'Lusky referred to wet meters. In Sheffield they were happy in having all wet meters. From his experience, he would never think of going over to dry meters. The wet meter seemed to him certainly more reliable, and it also provided a saving in the cost of repairs.

Mr. HAROLD E. COPP (Hull) said he must confess he was a little alarmed at the statement that so very few fittings in houses would stand any test. He thought the reason would be found to be the bad fittings, rather than the pipes themselves. A very large number of fittings coming under his notice showed minute leaks at the taps; and he thought this was one of the principal causes of the trouble. It behoved them to get their fittings as tight as possible. The way he had overcome the matter at Hull, having no statutory powers, was by selling to the fitters from the undertaking's own stock. For what fittings from that stock that were put in by the outside fitter, he was charged only 5 p.ct. on the Company's actual cost price. The fitter therefore preferred to come to the undertaking, and they saw that he got good fittings.

Mr. H. DAVIES (Chesterfield) believed the Manchester Institution were instrumental in preparing a specification of this kind some years ago; and he thought it was still fairly up-to-date. If not, he would suggest it should be made so. He believed that before very long the industry would be required to carry out this phase of work with the utmost possible precision. With regard to the 24 hours' notice which consumers had to give, Mr. M'Lusky said it must be given either in writing or by a call at the office. Did he find any difficulty in people calling at the office and not giving notice in writing? In regard to the fitters, were they Corporation fitters or local plumbers? He found it extraordinarily difficult to insist in every case on having a meter fixed as Mr. M'Lusky suggested it should be done, though the local by-laws said it should be done in that way. He fancied, if they insisted too much, they would get no gas at all into some places.

Mr. W. W. ATLEY (Stockton), President of the North of England Association, said he had had a complaint only that day from a consumer, who asked what was their standard pressure. The consumer said that before putting on a cooker he got 6¾ in. water gauge, and on the cooker being put on the pressure dropped to 6 in. Upstairs, for a water boiler, the pressure was only 4 in. The reply sent to him was that the standard pressure was 2 in. water gauge; and if he was getting 6 in., he was getting three times more than that. As to the inequality upstairs, he should get a local plumber to make it right. Mr. Atley said his undertaking had a Bill going through Parliament, by which they would have powers to provide, if they so desired, a specification for internal pipes; but there was so much red-tape attached to it from a municipal undertaking point of view, that he, personally, was not anxious to be the instigator of preparing the specification. At Stockton, owing to local conditions and bargaining, they were very generous in free service pipe, giving up to 50 ft. from the main. It used to be 30 ft. He had a complaint recently of a plumber who had fixed a gas fire for the undertaking, under a scheme which they had with the plumbers; and the complaint was that they could get no gas to it. On investigation, it was found that the solder had run right through and blocked-up the pipe. Mr. Atley thought the undertakings, however, should foster as much business as they could with local plumbers; and in Stockton they had a standard price for fixing fires up to 30 ft. from the main. Anything beyond this was paid for by the consumer at so much per foot. They allowed the fitters half the year's hire on the fire, as a commission for their help in getting the business.

Mr. W. M. CARR (Stretford), referring to loss of pressure when testing, said it seemed to him that they ought to be able to obtain powers such as those held by the water undertakings, to enable them to stamp appliances and fittings. If they made sufficient representations to the Board of Trade, such powers would eventually be given them. That they were very necessary was borne out by what Mr. M'Lusky said. He knew this was not a new suggestion, but he thought they ought to try to bring it about.

The PRESIDENT said, regarding the powers of undertakings to make these specifications and enforce them, the Bedford Gas Company had recently got authority to specify and enforce. They in Harrogate, in an Order received from the Board of Trade, which was now before the House of Commons, had similar clauses; and it seemed to him that if other undertakings applied to the Board of Trade, they should have no difficulty in getting them. At Harrogate they had been working on the Manchester specification for some time. He agreed with Mr. Carr that power should be given to insist on a higher standard of work, such as water undertakings possessed. It was a matter of both satisfaction and safety to consumer and supplier alike.

Mr. A. E. MOTTRAM (Ossett) asked that the discussion, which was on a subject of great interest, should be adjourned to the next meeting, to be renewed on that occasion; and this was agreed to.

Mr. HALKETT said some observations made prompted him to add that the installations put in by the builders in Sheffield were subjected to a test of 4 lbs., and had to stand for half-an-hour. He found there was no difficulty in getting pipes to stand the 4 lbs. pressure; but it would be very difficult to get some fittings to stand it.

Mr. M'LUSKY said he would reserve a detailed reply, in view of the renewal of the discussion on a future occasion; but there were one or two points to which he might refer. He agreed with Mr. Halkett and Mr. Copp. There was no difficulty with regard to pipes, joints, or the work of the craftsman on the job. The whole of the difficulty was with the fittings. At Halifax they were wholesale distributors, and they found they had to reject a good many fittings, even from a house of good repute. They had reason to adhere to the letter of the specification. They did not take the responsibility of laying pipes in private grounds. The pipe was the property of the owner of the grounds, and he was responsible in the event of leakage. From the main to the meter they charged only once. Their fitters were registered. They had a co-partnership scheme with all fitters in the town who were qualified to be registered. The fitters got the whole of the difference between the invoice price and the sale price; the gas undertaking got nothing in that respect. If the gas undertaking made the sale, it had all the profit.

The scheme was an inducement to the fitters to come to the undertaking to buy. In Halifax they found the architects and builders had been habituated to work with the undertaking. The undertaking's men were always in contact with them, and they got to know when an installation was required, and it was simply booked. As to the suggestion of stamping, the clauses he had quoted amounted to the equivalent of powers to stamp.

On the motion of Mr. G. S. Frith (Runcorn), the thanks of the meeting were accorded to the Harrogate Gas Company for their hospitality, and to Mr. Robinson for all he had done for the members throughout the day.

Mr. Robinson briefly acknowledged the vote.

The party were then conveyed to the Harrogate Gas-Works, where tea was subsequently served.

NEW HOLDER AT ROMFORD.

Inauguration Ceremony.

With the recent inauguration ceremony in connection with a new boiler at the Romford Gas-Works, the completion was reached of twelve months' work; the foundations of the tank having been laid in April, 1924. The opening of the valve to admit the first gas to the holder was performed by Miss Ellen Johnson, the daughter of Mr. Henry Johnson, who is Chairman of the Company. The new holder has a capacity of 1½ million c.ft., and was constructed by Messrs. Westwood & Wrights, Ltd., of Brierley Hill.

Mr. Johnson said the reason that the Company decided to have the holder was because the output was a million c.ft., and the storage was only half a million, which was the cause of much work and anxiety to the officers. The new holder would make the work easier and give better pressure to the extremities of the district. The Hon. Charles Rhys, M.P. for the Romford Division, referred to the growth of the neighbourhood and the necessity for the enlargement of the undertaking. When Miss Johnson had opened the valve, he, on behalf of the Company, asked her to accept a gold wrist watch and bracelet as a memento of the occasion. On this was inscribed: "Presented by the Romford Gas Company, Ltd., to Miss Ellen M. Johnson, daughter of the Chairman, upon the opening of the new gasholder, May, 1925."

The party then adjourned to the Board Room, where the Chairman proposed success to the new holder, coupled with the names of Messrs. Westwood & Wrights and the Company's General Manager, Mr. Frank Wright. With the toast was coupled also the name of Mr. Robert Wyld (the Foreman Erector).

Responding, Mr. Wright (of Messrs. Westwood & Wrights) said the new holder was a three-lift spiral guided one; the tank having a capacity of 15,589 tons of water. It was 147 ft. 6 in. in diameter by 33 ft. 3 in. deep, and weighed 337 tons. It contained 750 plates, 1 in. to ¼ in. thick, and was held together by 68,000 rivets. The holder bottom lift had a diameter of 145 ft., the middle lift 142 ft. 6 in., and the inner lift 140 ft. There were 328,400 rivets used in its construction. Proceeding, he asked Miss Johnson, on behalf of the firm, to accept a cut-glass rose bowl, made at the glass works almost next door to his firm's premises. Referring to the gasholder, he added that, without the full co-operation of the staff and men at the works and on the site, it would have been impossible to carry out such a contract successfully. That such a holder was required to deal with the gas consumption was sufficient evidence of the progress of the Romford Gas Company; and if this progress continued at the same rate, it would not be long before the firm would have the pleasure of building another holder for the Company.

Gas at the Printers' Exhibition.

The above exhibition at the Royal Agricultural Hall, Islington, is one of the best of its kind that has been held in connection with the printing trade, and is of exceptional interest to the gas industry, if only for the fact that no solid fuel whatever is used in connection with any of the furnaces that are being displayed. Gas has been applied in every case, and a great deal of interest has been created in this connection. The surface combustion plant supplied by British Furnaces, Ltd., of Chesterfield, is shown as standard equipment on the stands of the largest firms represented at the exhibition. An illustrated description of the applications of gas to the printing trade, as demonstrated at the exhibition, will appear in the "Journal" next week.

Main Surveying by Air.—The "American Gas Association Monthly" reproduces a photograph showing the method employed by the Louisville Gas and Electric Company for locating pipeline rights-of-way by means of aeroplane pictures. In this type of work precise surveying is not essential; and the air photographs indicate the exact location, in approximately correct scale, of everything on the surface of the ground—such as streams, houses, and fences. Photographic maps may also be used to obtain contours, by simply running a base line along the object to be surveyed.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Gas Engineers as Directors.

Sir,—Dr. Carpenter, in his speech last year at the luncheon giv by the President of the Institution of Gas Engineers, raised a ve interesting and important point. He asked where had we men the gas industry to-day to follow in the steps of the great men the last generation—Sir George Livesey, Sir Corbet Woodall, M Charles Hunt, Mr. Harry Jones, &c. To-day, more than ever, t gas industry requires men of this calibre, not only to assist its pr gress, but also to protect its interests in face of Government su vention to a younger, and in many ways a rival, industry.

The honoured names mentioned by him were all borne by tho who were engineers in the first place. I would submit that we ha in our industry to-day men of equal technical ability; it would sad to think we had not those who have the necessary personali and character latent in them. I believe it is only opportunity th is lacking.

Our technical men are kept far too much to executive wor Managerial and directorial responsibilities develop personality, i crease confidence, and make character. Many gas companies ha on their staffs engineers who have proved their true worth as exec tive officers, and who have made their companies' interests th life work. If in such cases these men were appointed to the Boa of Directors while still retaining their executive duties, I am su the companies would benefit, and the gas industry would be strengt ened, by having at their call men of high technical skill, and fu used to directorial responsibilities.

We need our fullest strength, organized on the basis of the i dustry as a whole, and co-ordinated with one ideal before us—t good of the nation and the good of the gas industry.

Arthur Duckham,

52, *Grosvenor Gardens, London, S.W.* 1,
May 25, 1925.

Mr. Milne Watson and Government Electricity Development Schemes.

Sir,—Your readers will peruse with keen interest the able addr that our President, Mr. D. Milne Watson, delivered at the annu meeting of the Society on the 20th inst.

The subject with which he dealt is of such vital importance to branches of the gas industry that your readers may be interested learn that we are enlarging somewhat on the suggestion of our n President (the Rt. Hon. Sir Alfred Mond) by circulating a repr of the address to every Member of Parliament, thereby giving them opportunity of realizing *facts* which otherwise perhaps might come to their notice.

B. B. Waller,
Chairman of the Council of the Society of Brit Gas Industries.

56, *Victoria Street, Westminster, London, S.W.* 1,
May 25, 1925.

Low C.V. Gas and the Unaccounted-for Gas.

Sir,—As Mr. Keillor has so well pointed out, the distribution low C.V. has nothing whatever to do with unaccounted-for g Further, he urges that the Technical Press would be helpful to t industry if they were much more aggressive in their criticism such ridiculous statements. I wish heartily to endorse Mr. Keillo remarks.

I should also like to direct attention to Mr. West's most rec utterance on the subject: "I still think, however, that before a lo grade gas can be distributed successfully all over the country, mu preliminary work in the way of improving, purifying, and cleanin out distribution systems will require to be undertaken in many cas unless someone comes along with a new type of meter."

Such a statement means nothing short of this—that in Mr. We opinion the gas industry should regulate the quality of gas it suppl to suit the measure used to register consumption. Apply such reas ing to any other trade. Do the scales or measures by which go are sold limit the quality or cheapness of such goods?

Geo. Helps

Nuneaton Gas Company.
May 21, 1925.

A Useful Sport.—Ratting by Motor Car.

Sir,—The danger lurking in the fumes from motor cars when exhaust is allowed to escape within the confines of the garage w pointed out in the "Journal" for May 6, p. 362.

This danger can best be exemplified to the popular mind by turni to the credit account the asphyxiating qualities possessed by these haust fumes. The fumes are particularly heavy, and if, when in rat infested area, a hose be attached to the exhaust and led to a hole, the gases will soon permeate the rat warren, and displace lighter air, thereby asphyxiating the young rats and forcing the rats to the surface, where a good dog would have the time of life. Considering the vast numbers of motor cars held by you sportsmen, the damage done by the hordes of rats left us as an aft math of war should soon be reduced to negligible proportions, w advantage to human health, and added peace of mind.

Ad Rem

At a meeting of the Rhyl Urban Council last week it was sta that the Gas Department showed a profit for the past year of £218 after paying loan charges of £1514.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Statutory Gas Companies (Electricity Supply Powers) Bill: Brought from the Commons, and read the first time.

Forfar Gas Order Confirmation Bill: Returned from the Commons, agreed to.

Oldham Corporation Bill: Reported, with amendments.

Uckfield Gas and Electricity Bill: Read the third time, passed, and sent to the Commons.

Blackpool Improvement Bill: Reported from the Select Committee, with amendments.

Gas Regulation Act.

In the House of Lords, on the 19th inst., the Earl of Clarendon (on behalf of Viscount Peel) moved that the draft Special Orders relating to the Altrincham Gas Company and the Stockton-on-Tees Corporation proposed to be made by the Board of Trade be approved; and this was agreed to.

HOUSE OF COMMONS.

Progress of Bills.

Forfar Gas Order Confirmation Bill: Read the third time, and passed, without amendment.

Kilmarnock Gas and Water Provisional Order Bill: Committed, read, and discharged; considered, read the third time, and passed.

Horley District Gas Company (Electricity Supply) Bill: Reported (preamble not proved).

Uckfield Gas and Electricity Bill: Read the first time, and referred to the Examiners.

South Metropolitan Gas Bill: As amended, considered; to be read the third time.

The draft of a Special Order proposed to be made by the Board of Trade under section 10, on the application of the British Gas Light Company, with respect to the Trowbridge undertaking, was presented to both Houses.

Gas Companies and Electricity Supply.

Mr. LOOKER, on the 18th inst., asked the Minister of Transport whether he would give an undertaking that, under the scheme of general electrification contemplated by the Government, the rights and undertakings of existing gas companies would be duly protected.

Colonel ASHLEY, in reply, said the Government's proposals in this matter had not yet been formulated. At present, therefore, it was impossible to say whether any questions would arise under the last part of the question. The Government had got to consider the proposals which were now being sent up to them.

HORLEY DISTRICT GAS COMPANY (ELECTRICITY SUPPLY) BILL.

House of Commons Committee, Monday, May 18.

(*Before Major* MALONE (Chairman), *Mr.* SAVERY, *Mr.* C. W. CROOK, *and Sir* HENRY JACKSON.)

The purpose of the Bill was to empower the Horley District Gas Company to supply electricity, jointly with gas. There was opposition by the Horley and District Electricity Supply Company, Ltd., to whom the Electricity Commissioners have already granted a Special Order for the purpose of supplying electricity in Horley, which Order is now awaiting confirmation by the Minister of Transport.

The Gas Company were represented by Sir HARRY COURTHOPE-MUNROE, K.C., and Mr. JACQUES ABADY; and the Electricity Company by Mr. W. CRAIG HENDERSON, K.C., and Mr. F. J. WROTTESLEY.

The Bill had already been passed by the House of Lords, where an obligation was put upon the Gas Company to supply electricity within the compulsory area within twelve months after Royal Assent had been given to the Bill. (The proceedings before a Committee of that House, presided over by the Earl of Clarendon, were reported in the "JOURNAL" for March 25, p. 750; April 1, p. 63; and April 8, p. 128.)

The story which was presented by Sir HARRY COURTHOPE-MUNROE, who opened the Bill, was the same as that put before the House of Lords Committee on the previous occasion, and the opposition by the Electricity Company was the same. Briefly, the position, as stated, was that the Gas Company decided, in 1922, when Mr. H. J. Randall (Engineer and Manager of the Yorktown and Blackwater Gas and Electricity Company) became a Director of the Horley Gas Company, to apply for powers to supply electricity. A statutory gas company, however, can only obtain such powers by the promotion of a Bill in Parliament; and, in view of the heavy expense involved thereby, and the fact that Mr. R. G. Clarry, (M.P. for Newport) was to present a Bill to Parliament which would enable statutory gas companies to apply to the Electricity Commissioners for an Order giving electricity powers, thus placing them in the same position as any other company, the Horley Gas Company decided to await the passing of Mr. Clarry's Bill. The matter dragged on until 1924, when it was considered that, owing to the state of Parliamentary business, the passage of Mr. Clarry's Bill was uncertain; and the Gas Company promoted the present Bill. Meanwhile, the residents at Horley had formed a Company for the purpose of supplying electricity, and, though the Gas Company had informed them of the steps they had taken, the Electricity Company applied to the Electricity Commissioners, and obtained an Order empowering them to supply electricity. This Order is awaiting confirmation by the Minister of Transport; and, as the Gas Company have lodged an objection, an inquiry has to be held before confirmation is given. The Gas Company claim that, being an established Company, they are in a better position to supply electricity cheaply, inasmuch as they could raise capital more cheaply, and could employ their present Directors, staff, and workmen in the two undertakings, so spreading overhead charges over the two undertakings. They also claim that they had the matter of electricity supply under consideration before the gentlemen who had formed the Electricity Company; but the latter claim that the Gas Company's activity is the result of the formation of the Electricity Company, and that the Gas Company wish to obtain electricity powers in order to avoid active competition with gas.

COUNSEL pointed out to the Committee that Parliament had, on 23 occasions, granted power to gas companies to supply electricity, and emphasized that a cardinal feature of the Horley Gas Company's scheme was that the waste heat arising from the process of gas manufacture was to be used for generating electricity. It was estimated that, in the first year, three-quarters of the electricity produced would be generated by steam raised from this waste heat, and that in the second year two-thirds would be so generated, so that only one-quarter of the electricity in the first year, and one-third in the second year, would have to be generated by fuel-consuming engines.

Mr. *H. J. Randall* (Director of the Horley District Gas Company, and Engineer and Manager of the Yorktown and Blackwater Gas and Electricity Company), said that at the first meeting of the Horley Company which he had attended as a Director he had brought forward the question of electricity supply, because he considered that the district would be bound to have a supply sooner or later, and the time was opportune for the Gas Company to provide it. The Directors had considered the matter, and he had dealt with the engineering aspects. The obvious thing to do was to obtain a bulk supply, if possible; but, owing to the difficulty of obtaining a suitable supply, the Company decided to generate electricity themselves. He confirmed Counsel's statement as to the steps which had been taken. He considered the Horley Gas Company were in a better position to supply electricity than was a new company dependent on electricity revenue alone. A suggestion had been made by the petitioners that dividends payable on certain of the stock would be subject to a sliding-scale dependent on the price of gas, and not on the price of electricity, and as a result of the proposals of the Bill it would be in the interests of the Gas Company to reduce the price of gas in order to earn the right to pay a higher dividend on the capital to be used for the electricity undertaking, and to earn the money required for paying that higher dividend by keeping-up the price charged for electricity. In reply to this, Mr. Randall pointed out that the gas and electricity capital would be kept separate, and that the accounts had to be submitted to auditors appointed by the Electricity Commissioners, and if it were found that the Company were doing such a thing, they would be quickly brought to book. But, from the practical point of view, after £15,000 to £20,000 had been spent on electricity mains, surely it would be suicidal to increase the price of electricity to the maximum, and prejudice the possibility of increasing the demand for electricity so that the gas would benefit. Even if that were done, the increased remuneration resulting from increasing the price of electricity would be so small as to be practically negligible in affecting the dividend. Witness then referred to the supply of electricity and gas by the Yorktown and Blackwater Company, and gave figures to show that the electricity and gas undertakings had both developed rapidly side by side. The development of the electricity undertaking there had stimulated the sale of gas as well.

Mr. CRAIG HENDERSON, in the course of his cross-examination, put a number of questions, in which he suggested that the surplus heat generated in the gas manufacturing process was used for generating steam for auxiliary plant in the gas-works themselves in up-to-date works. Therefore, if it were used for generating electricity, the gas-works must go without some of these modern appliances.

Witness replied that some of the big works were using waste heat in this way, but the question was a new one; and, inasmuch as waste solid fuel—which fuel could not be sold—was used for generating steam in the Horley Gas-Works, the waste heat which it was now proposed to use for generating electricity would be wasted unless it was so used.

The Committee adjourned.

Tuesday, May 19.

Mr. *William Cash* (of Messrs. Cash, Stone, & Co., Chartered Accountants, Past-President of the Institute of Chartered Accountants, and Chairman of a number of gas and other public utility companies) was then called to give his expert views as to the suggestion that the Gas Company, if given electricity supply powers, might keep up the price of electricity, so as to reduce the price of gas and enable higher dividends to be paid under the sliding-scale. He did not argue with the statement as such, because where there was a sliding-scale, of course, a company's interests lay in reducing the price of gas and so increasing the dividend; but it only applied so far as it was not checked by commercial considerations. The Horley Gas Company, for instance, were to-day charging a price for gas which would enable them to pay a higher dividend than was actually being paid. He himself was Chairman of the Bournemouth Gas and Water Company, where a sliding-scale operated with regard to gas supply; and it might be said that that Company charged a higher price than was necessary for water, in order that a higher dividend might be paid by reducing the price of gas. But this was not so. The water and the gas charges were regulated by legislation, and the Company were not paying anything like the dividend they might pay. He referred to other companies where two commodities were being supplied, one of which was the Tottenham District Light, Heat, and Power Company, which supplied gas over a large area, and in one district—Wood Green—both gas and electricity. The progress made in regard to both gas and electricity sales in Wood Green had been rapid; and, in spite of the supply of the two commodities being in the same hands, electricity development had not been stifled in any way. Again, at Bognor, where gas and electricity were in the same

hands, there had been a simultaneous decrease in the price of each, and a progressive increase in sales. It was the commercial aspect which really applied—a company which had embarked capital in their undertaking would, in their own interests, make the thing a success if possible. To do this, they would keep prices down, and in the case of both commodities a decrease in price was almost invariably followed by an increase in sales. Dealing with the capital of the Horley Company, witness said that the total amount which could be paid in extra dividends as the result of a reduction in the price of gas of 1d. per 1000 c.ft. was £82, and it was not likely that the Company, for the sake of another £82 a year, would embark on substantial capital expenditure in connection with electricity. There were other companies supplying both commodities, and he had never heard any suggestion of unfairness.

Asked by Mr. Craig Henderson, in cross-examination, to give information as to the results obtained where there were two competing concerns supplying gas and electricity, Mr. Cash referred to the Croydon Gas Company, which was competing with the Corporation electricity undertaking. Both concerns were growing rapidly. Asked whether the enormous strides made in the development of the gas industry were not due to the competition offered by the introduction of electricity, he admitted that this was a factor. It was then suggested by Counsel that, though the Horley Gas Company had been supplying gas in Horley since 1886, yet local residents had now subscribed £10,400 in order to set up a competitor to supply electricity; and he asked whether this did not suggest that the community would be better supplied if the competitor were allowed to go on. Mr. Cash replied that it did not necessarily follow, and that the combination of the two undertakings would result in advantages to the community.

Sir Harry Courthope-Munroe said he was willing that, if the Committee could devise any safeguard against the tendency suggested by the petitioners, it should be inserted in the Bill.

Mr. A. Hugh Seabrook (of Sir Charles Bright & Partners, Electrical Engineers, and late General Manager and Engineer to the West Ham and St. Marylebone Corporation electricity undertakings) said he had been advising the Horley Gas Company with regard to the scheme, which was on the same lines as other schemes which had been sanctioned by Parliament, except that it was proposed to generate a portion of the electrical energy supplied by means of surplus heat from the gas manufacturing process; there being sufficient surplus heat to produce about 900 lbs. of steam per hour. In the first year of electricity supply, three-quarters of the electricity required would be generated by this means, and in the second year two-thirds of it; the saving in the first year by this means being £219, which was substantial in a small undertaking. Generating costs in the first year he estimated at £373, £300 of which represented wages and repairs and maintenance of plant, and £73 cost of fuel (gas or oil) required to drive the engines which would produce that portion of the electricity not generated by utilization of waste heat. Since the Bill was promoted, the Gas Company had promised to give a bulk supply to the Sussex Electricity Supply Company, Ltd., for the purpose of supplying Crawley, which adjoined the proposed electricity supply area of the Gas Company, and was within the existing gas limits. It would be a great advantage to have a big customer of this sort. Witness handed-in tables showing the estimated results of the working of the undertaking in the first two years, which were exactly the same as those given when the Bill was in the House of Lords.

It was pointed out by Mr. Craig Henderson, in cross-examination, that, though the accounts of the two undertakings were to be kept distinct, the gas undertaking was handing-over fuel to the electricity undertaking and charging nothing for it; and he suggested that that was why Mr. Seabrook was able to show a profit from the first year's working of the electricity undertaking. [The net profit estimated for the first year was £532.] Witness replied that the surplus heat would otherwise be wasted. Questions were then put with regard to stand-by plant, it being stated by Counsel that if one generating set, of 50 kw. capacity, broke-down, the maximum output would be 30 kw. to meet a maximum load of 50 kw. Mr. Seabrook agreed, providing the 50-kw. set broke-down completely; but a breakdown might not necessarily involve the stoppage of the complete set. In answer to further questions, in which it was suggested that there was no stand-by plant provided, witness disputed this, saying that the scheme compared with similar schemes in this respect; he had provided what experience had proved to be sufficient, and there was sufficient stand-by plant provided except for about 100 hours or so throughout the whole year, when the demand was at its peak.

With regard to the generating station, Counsel was concerned because this was to be placed in the centre of the gas-works. If the present Bill were passed, the consent of the Electricity Commissioners would have to be obtained before the generating station could be erected, and they would have to take into consideration the fact that, whereas the Local Authority had statutory power to purchase the electricity undertaking, they had no such power to purchase the gas undertaking. Therefore, by placing the electricity generating station in the centre of the gas-works, surrounded on all sides by buildings, the local authority would be denuded of their statutory right to purchase it. Witness replied that in a previous case, where similar conditions obtained, it was provided that, if the local authority exercised their right to purchase the electricity undertaking, they could also purchase the gas undertaking by agreement. Counsel retorted that the local authority might not wish to do this, and added that a movement was on foot to make Horley an urban district, instead of part of a rural district as at present. Mr. Seabrook remarked that even if the Local Authority purchased the undertaking, they would not be able to supply electricity cheaper than the Gas Company could.

Mr. *A. E. Broadberry* (Director of the Tottenham District Light, Heat, and Power Company) gave evidence as to the success which had attended the supply of both gas and electricity in Wood Green, and stated figures to show that there had been rapid progress in that area in the development of both. Applying his experience to the conditions in Horley, it was fair to assume that the supply of electricity by the Gas Company would lead to equally good results. Further, the Horley Gas Company had an advantage which the Tottenham Company lacked at Wood Green—namely, the utilization of surplus heat from the gas-works for the generating of electricity. To show that the practice of joint gas and electricity supply was widely adopted in the United States, witness had procured a list of 384 American concerns which were supplying both commodities.

Mr. Craig Henderson, in cross-examination, suggested that the conditions at Wood Green and Horley were not comparable, because the gas-works and the electricity generating station for the former were a long way apart. To his suggestion that other companies were supplying electricity cheaper than were the Tottenham Company, Mr. Broadberry retorted that he must have picked out special cases, and himself referred to instances in which electricity companies were charging higher rates than the Tottenham Company.

Mr. *George Baker* (a resident of Horley) spoke of the desirability of a supply of electricity in Horley, and was of opinion that the residents stood a better chance of getting a supply from an established company than from a new company. He did not believe the gas consumers of Horley, as a body, had any complaint to make against the Gas Company.

Mr. *D. Napier-Whittingham* (Managing Director of the Sussex Electricity Supply Company, Ltd.) corroborated the statement that his Company wished to take a bulk supply from the Gas Company for the supply of Crawley. They would be unwilling, however, to arrange for a bulk supply from the Electricity Company, if the present Bill were rejected. Replying to Mr. Craig Henderson, in cross-examination, he admitted that, if he were satisfied that the new Electricity Company were sound enough to be able to give his Company a bulk supply of a sufficient quantity, over and above that required for the supply of Horley, his Company would rather take that bulk supply than generate electricity themselves.

Sir Harry Courthope-Munroe, in order to meet the objection by the petitioners that the price of electricity might be increased in order to reduce the price of gas and allow larger dividends, offered to insert a provision for the revision of the maximum prices for electricity by the Electricity Commissioners, in accordance with the provisions in the schedule of the Electricity (Supply) Act, 1922. The Gas Company, however, were still of the opinion that it was not really wanted.

This closed the case for the Gas Company.

Mr. W. Craig Henderson, in his address on behalf of the Electricity Company, impressed upon the Committee that it was the direct result of the possibility of a competitor coming into the field that the Gas Company had become seized with an affection for electricity supply. He also pointed out that never in the history of gas and electricity legislation had Parliament given a gas company electricity powers in competition with an electricity company who applied for powers at the same time. Dealing with the point made by the Gas Company, that when the Electricity Commissioners had granted the Electricity Company's Order the Gas Company had not been heard, he said that the Commissioners had only one scheme before them which they could consider. As to the procedure which should have been followed subsequently, he said that when confirmation of an Order was objected to in the House of Commons, the procedure laid down by the Speaker was that the matter should be referred to a Committee. The proper procedure for the Gas Company to have adopted would have been to have let the Electricity Company's Order come into the House, and to have got somebody to put up a motion against confirmation. Then the Order and the Gas Company's Bill would have come before a Committee as competing schemes. Instead of this, the Gas Company had lodged a memorial with the Ministry of Transport, objecting to confirmation of the Order, which rendered it necessary for the Minister to hold an inquiry, and the Electricity Company's scheme was held-up outside the House until the present Bill was heard. This procedure had put the Electricity Company at a disadvantage. In Horley the Gas Company had been selling gas without any competition, but when a competitor came along they wanted that competitor under their own control. He submitted most strongly and most confidently that it would not be in the interests of any public consumer in Horley that the electricity supply should be taken out of the hands of the local residents (who were so keenly interested in it as to put up £10,400 out of their own pockets), in order to give that power to supply to the Gas Company, who were only taking it up because they felt at last compelled to do so. At this point, Mr. Craig Henderson introduced a new aspect from which to view the whole question. It had been stated by both parties that it would have been preferable to obtain a bulk supply for distribution in Horley, if such a supply could be obtained on suitable terms; but that, owing to the difficulty of securing such a supply, each had decided to generate locally. It was now announced by Counsel that the Horley Electricity Company had made arrangements for a bulk supply from the County of London Electric Supply Company, whose super power station was at Barking, and whose mains stretched almost to the borders of Horley. The price was one which the Horley Electricity Company were willing to pay; and the arrangement would not only dispense with the proposal to erect a small generating station at Horley, but would bring to Horley an unlimited supply of power, which could be distributed at a reasonable price. It would carry out the policy which the Electricity (Supply) Act of 1919 had in view—namely, the grouping into centres of electricity generation, and the dispensation of the operation of small generating stations. As to the point raised by the Electricity Company, that, where gas and electricity were supplied by one company, any profits from electricity affected the price of gas, he said that Mr. Cash, in his evidence, did not gainsay it, but had said that it was checked by commercial considerations. But what kind of commercial considerations would one get from a gas company such as that at Horley, one of whose Directors had said in evidence that the amount of electricity he would sell in Horley would be small as compared with the amount of gas, and would not be sufficient to affect his dividends? Was that the kind of electricity development the Committee wanted in Horley? The Electricity Company wanted to do better than that, and wanted to be allowed the chance. They

uld be good competitors with the Gas Company, and would make m do better as a gas supply authority. This sort of competition s the life of industry. In this particular case there was the first nstration of the proposed exclusion of a local electricity supply com ny, armed with a Special Order, as against a gas company which d never done anything much in the way of gas supply, let alone ctricity supply.

Wednesday, May 20.

Mr. CRAIG HENDERSON, dealing with Mr. Seabrook's estimates of working of the electricity undertaking by the Gas Company, ited that they were not worth the paper they were written on, be use they were based on the supply to Horley alone, whereas it had w been stated that it was proposed to give a bulk supply to Crawley. that were so, then the plant required would be quite different from it required if only Horley had been supplied.

Mr. *C. R. St. John* (Consulting Engineer advising the Electricity mpany) gave evidence as to the scheme of the Electricity Company supplying Horley, and referred to the delay which had resulted m his efforts to obtain a bulk supply in the first place, which d not materialize. He had then decided to erect a local generating tion, but would not now proceed with this, in view of the offer by e County of London Electric Supply Company to supply in bulk. e terms for this bulk supply were to be £6 per kilowatt per num, *plus* a running charge of 0·75d. per unit. Therefore, the bles he handed in to the Committee, to show the results of the orking of the undertaking, differed from those submitted in the ouse of Lords, inasmuch as they were based on obtaining a bulk pply, and showed that in the first year he hoped to meet all charges thout making a profit; in the second year he expected a surplus of 400; and in the third year a surplus of £1000.

Sir HARRY COURTHOPE-MUNROE, cross-examining, pointed out at, since the Electricity Company had commenced preparing their hemes, four different sets of figures had been produced. He also certained from witness that no contract had yet been made by the orley Electricity Company with the County of London Company for bulk supply, and suggested that the terms of the contract were ill in the air.

Witness replied, however, that they were in an acceptable form.

In the course of further questions, Sir Harry obtained from witness e admission that there were no powers existing which would enable e main to be laid to carry the bulk supply from the termination of e County of London's Company existing mains to the borders of orley, and pointed out that nothing was contained in witness's gures to cover the cost of obtaining such powers. He suggested that the present Bill were thrown out, and the Electricity Company ught powers to carry their main over other people's territory, as ey would have to do, some of the parish councils might raise objec on—it was proposed to provide an overhead wire, which system was uitful of opposition—and therefore, the position of the Electricity ompany was not a safe one. Witness replied that he did not antici ate difficulty in this connection, and considered the present scheme a fer one than his previous plan.

Mr. *F. C. M'Quown* (Manager and Secretary of the County of ondon Electric Supply Company) corroborated the evidence that his ompany were willing to give a bulk supply to the Horley Electricity ompany if the latter Company obtained powers to supply in Horley.

Sir HARRY COURTHOPE-MUNROE pressed witness as to the posi on of the County of London Company's mains at the present time, id ascertained that they terminated at a point which was 9 miles om Horley as the crow flies, and 11 miles by road. It was ex ained that the County of London Company hoped to obtain powers supply in part of the area between their existing area and Horley, id they would then provide four miles of the bulk supply main. he Horley Electricity Company would either obtain powers to supply the remainder of the area between the two companies, or get a rayleave, and provide the other 5 miles of main. There were no owers existing at the moment, and Counsel pointed out that, if here was opposition, it would take time and cost money to get these owers.

Witness said that his Company would lay their part of the main five or six months after obtaining the necessary Order. Re examined, he said it was part of the policy of his Company to afford ulk supplies to companies who were distributing electricity only.

Sir *Harry Haward* (one of the Electricity Commissioners), ques oned as to the complaint of the Gas Company that they were not eard when the Commissioners considered the Electricity Company's rder, said that the Commissioners could not have considered the as Company's scheme, because it was not before them. In some ases the Commissioners were asked specifically to hold a local in uiry, but no such request had been made in this case. (The evidence iven is to the effect that the Commissioners were informed, before he Electricity Company's Order was granted, that the Gas Company ntended to apply to Parliament for powers.) The general view of he Commissioners on the question of entrusting gas companies with lectricity supply powers was that there might be cases where it was ight and proper that the supply of electricity should be entrusted to a as company, because this might be the only means by which a dis rict could get a supply. Therefore, they did not consider that the roposal to entrust gas companies with these powers should be pposed on principle. They recognized, however, that on general rounds it was preferable that the supply of electricity should be in he hands of a body whose primary and sole duty was to supply elec ricity, where there was such a body able and willing to undertake it. t the same time, it must not be supposed that in every case the Com aissioners would think it should be entrusted to an electricity com any, because there might be cases in which a gas company could how an overwhelming advantage over an electricity company.

Mr. *R. L. Norris* (Chairman of the Horley Electricity Company) aid that that Company could have raised more than the £10,400 of apital already raised, but for the rumours existing with regard to he opposition of the Gas Company to their scheme. He was not ltogether satisfied with the Gas Company as a gas company, and considered that the Electricity Company would give a better supply of electricity than would the Gas Company.

Mr. *A. C. Cramb* (Chief Engineer and Manager, Croydon Corporation Electricity Department) expressed himself in favour of competition between gas and electricity undertakings, because it was a good thing for both. It would be unfortunate for the residents of Horley, in his view, if the supply of electricity and gas were under the same control. He gave figures showing the growth of the gas and electricity undertakings at Croydon, where there was active competition.

Sir HARRY COURTHOPE-MUNROE, summing up for the Gas Company, asked the Committee to consider the two schemes, as was done by the House of Lords Committee, and suggested that this was a case where Sir Harry Haward's remark as to a gas company showing an overwhelming advantage over an electricity company exactly fitted. The Committee, he said, were now asked by the Electricity Company to consider their fourth edition of figures; and the scheme as now put forward had not been considered by the Electricity Commissioners. This was an extraordinary state of things. If the Committee approved of the scheme, there was not a rag of certainty about it. The existing mains of the Company who were to give the bulk supply were miles away from Horley; and before they could get to work they had to get two, and possibly three, Orders. This meant delay; and if there were opposition when they applied for their Orders, there would be still more delay. After the Orders were obtained, they had something like eighteen months of work in front of them; and he considered that it would be three years before Horley had the least chance of getting a supply. Therefore, it seemed ridiculous to ask the Committee to throw out the Gas Company's Bill. If it were passed, there would be an obligation upon the Gas Company to supply electricity within one year. It had been suggested that the Gas Company would juggle with the accounts, but he was content to adopt any safeguard in that connection which the Committee could devise. Again, the Gas Company proposed to supply a larger area than did the Electricity Company. So strongly did he feel that the Gas Company were able to meet any competition that he suggested that they should be given their Bill, and the Electricity Company's scheme could be confirmed by the Minister of Transport, if he thought fit, and then there would be centred in Horley the most intense cut-throat competition there could be.

The Committee conferred in private, and their decision was that the Bill be rejected.

OLDHAM CORPORATION BILL.

This Bill was considered by the Unopposed Committee of the House of Lords, presided over by the Lord CHAIRMAN (the Earl of Donoughmore) on Tuesday, May 19, and ordered to be reported for third reading.

There are some clauses of a general nature relating to the Oldham gas undertaking (referred to in the "JOURNAL" for Jan. 21, p. 143), and there has been no substantial alteration to these.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for May 20.]

Nos. 12,160-12,873.

BISMARCKHUTTE [Firm of].—"Gas generators." No. 12,505.
BLAKE, T. V.—"Scrubbing gases." No. 12,341.
CHANCE BROS. & Co., LTD.—"Gas-measuring apparatus." No. 12,855.
CUTLER, S.—"Gasholders, tanks, &c." No. 12,787.
FEHR, E. F.—"Gas cocks." No. 12,748.
JAQUES, A.—"Scrubbing gases." No. 12,294.
KIRBY, J. I.—"Gas pendants, &c." No. 12,669.
LEVER BROS., LTD.—"Gas-heated apparatus for airing clothes, &c." No. 12,779.
MACKENZIE, M.—"Distillation of tar." No. 12,614.
MARKS, E. C. R.—"Purification of gases." No. 12,618.
MILBOURNE, R. J.—See Cutler, S. No. 12,787.
MORGAN CHEMICAL CO., LTD.—See Jaques, A. No. 12,294.
OUTWIN, E.—See Mackenzie, M. No. 12,614.
RADIATION, LTD.—"Gas-heating apparatus." No. 12,230.
RUDE, J.—"Production of coke, gas, and tar from solid fuel." No. 12,195.
SAYER, H. B.—See Lever Bros., Ltd. No. 12,779.
SEMET-SOLVAY ET PIETTE STE. ANYE., STE. DES FOURS A COKE.—See Marks, E. C. R. No. 12,618.
SYLVESTER, J.—See Mackenzie, M. No. 12,614.
THEISEN, E. [Firm of].—"Apparatus for purifying, cooling, mixing, &c., gases." No. 12,470.
WRAITH, H. O.—See Chance Bros. & Co., Ltd. No. 12,855.
YATES, H. J.—See Radiation, Ltd. No. 12,230.

Evesham Gas Undertaking.—The annual report and statement of accounts have just been issued in connection with the gas undertaking of the Evesham Town Council. The increase in the make of gas was 1¾ million c.ft. The revenue account showed the total expenditure to have been £26,609, and the total receipts amounted to £28,801, leaving a balance (gross profit) of £2192. The amount received from the sale of gas was £18,561, against £17,985 last year. The capital expenditure, after deducting depreciation, stood at 36,549. Stocks on hand were valued at £1441, and the amounts due from sundry debtors £5324. On the other side, the amount of loan outstanding was £35. The next payment would wipe out the loan altogether. Alderman Fisher, the Chairman of the Committee, in moving the adoption of the accounts, remarked that, in view of the reduction in the price charged for gas, and the depression in trade generally, he thought they would agree that they had had a satisfactory year's trading.

LEGAL INTELLIGENCE.

ELECTRIC LIGHT AT BARWELL.

The question of substituting electric light for gas in Barwell, Leicester, came before the Divisional Court on Thursday, May 21, before Mr. Justice SALTER and Mr. Justice GREER.

The matter was raised on an *ex parte* motion by Mr. J. B. MELVILLE, who said he had to move, on behalf of Mr. Thomas Powers, for a rule directed to Mr. Wm. Freer, Chairman of the Barwell Parish Council, calling on him to show cause why a writ of *mandamus* should not issue, directing him to hold a poll of the electors of the parish of Barwell. There was an affidavit by Mr. Powers in support of the motion. In this Mr. Powers said he was a farmer, and Chairman of the Earl Shilton Gas Light and Coke Company. He was the owner of property in the parish of Barwell, and a local government elector on the register of voters in force in the parish, which was a rural parish with a population of 3008 or thereabouts, with an assessable value of about £12,357. He had been a member of the Barwell Parish Council for the last fifteen years, and was also a member of the Leicestershire County Council. A printed notice of a parish meeting purporting to be issued by Mr. Wm. Freer, the Chairman, was published in the parish, for a special parish meeting to be held on May 4. The meeting was convened, said Counsel, with respect to a proposal to raise a loan of some £900 for the purpose of establishing electric lighting in the parish. He (said deponent) attended the meeting, and voted against the resolution. Seventeen voted in favour of it, 14 voted against it, and 20 did not vote at all. The resolution was then declared carried, on a show of hands. He (deponent) demanded a poll on the resolution; but the Chairman refused to take one. On May 8 he instructed his solicitors to write to Mr. Freer informing him that unless notice of a poll was issued within seven days, in accordance with his request, application would be made to the High Court for a *mandamus* to compel him to carry out his duties according to law. Mr. Freer's reply to that letter, said Counsel, was addressed to Mr. Powers' solicitors. In it he said: "Your letter did not come as a surprise, knowing your client's love for the law and his many threats when crossed or baulked in any matter invoking its aid. I may say, as far as I am concerned, I do not accede to your client's demand for a poll. After giving the matter further consideration, I see no reason to alter my decision. According to my lay mind, I am justified in the course I have taken, and you may take what course you or your clients may desire." As a result, this application was made, added Mr. Melville, and the question involved was whether electric light should be substituted for gas, which had been previously supplied by the Earl Shilton Gas Company to this parish under the Local Government Act of 1894.

In the result, the Court granted a rule, to be returnable for argument one day early next term.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following notices have appeared in the "London Gazette" regarding applications to the Board of Trade under the Act.

SPECIAL ORDERS.

Langley Mill and Heanor Gas Light and Coke Company, Ltd.

The Company intend to apply for an Order under section 10, authorizing them to extend the limits of supply, to raise new capital, and to make provision for the more efficient conduct of the undertaking.

Hornsey Gas Company.

The Company intend to apply for an Order to authorize them to convert existing stock and create new stock, to define dividend rights, &c., to make provision as to borrowing, and for other purposes.

Oswaldtwistle Urban District Council.

The Council are applying for an Order to enable them to purchase additional lands, to make regulations regarding the laying of pipes, to charge on a thermal basis, to borrow money, and to fix the maximum price of gas at 1s. 3d. per therm.

Low-Temperature Carbonisation.—A circular has been issued by Low-Temperature Carbonisation stating the reasons for the creation of £500,000 of new debenture stock. This was agreed to at a meeting of stockholders held on May 5. It is an income charge issue, bearing 8 p.ct. interest cumulative, and the right to participate in profits for a further 4 p.ct. The amount to be issued at once is £300,000. It is offered at 95. The remaining £200,000 is held in reserve for exchange for the existing 6 p.ct. first mortgage debenture stock, or alternatively for issue in connection with the acquisition and completion of further contracts for the erection of low-temperature plants in the principal industrial centres.

Houghton-le-Spring Gas Company.—At the annual meeting of the Houghton-le-Spring Gas Company, of Durham, a satisfactory report was submitted; but the Chairman (Mr. W. A. Surridge) said he was afraid the outlook in regard to residuals was still unfavourable. They had already reduced the price of gas, and proposed to make another reduction shortly. A new holder was almost completed, and would be put into use shortly. They had entered into an agreement to take a supply of coke-oven gas from adjacent collieries, and expected it would enable them further to reduce the price of gas. The Board proposed to make an issue of new capital. A dividend of 7 p.ct. on the ordinary shares, compared with 6 p.ct. last year, was agreed to.

SAFEGUARDING OF INDUSTRIES ACT.

Gas Mantles.

The Inquiry into the application of the Incandescent Mantle Manufacturers' Association for the imposition of a duty on imported g mantles, under the Safeguarding of Industries Regulations, w opened at the Board of Trade Offices on Monday, May 18. The Co mittee consists of Sir FREDERICK MILLS, Bart., Sir JOHN BARRA Bart., and Mr. J. ARTHUR AITON.

The Incandescent Mantle Manufacturers' Association were rep sented by Mr. J. P. H. Soper (Managing Director, Monarch Mantl Ltd.). There was opposition to the imposition of a duty by a gro of importers of foreign mantles, members of the London Chamb of Commerce.

Mr. *Soper*, before giving evidence, dealt with the instructions Committees set up to inquire into applications under the Safeguardir of Industries Regulations, in their application to this particular i quiry, and showed how these instructions had been interpreted by t Association. The first point upon which it was the duty of the Co mittee to report was whether the industry was one of substantial in portance, from the point of view of the employment it afforded. I claimed that the mantle industry was of importance by reason of t nature of the goods it produced. Gas was probably the princip source of artificial light in the country at the present time. The g mantle was the key to modern gas lighting and to modern gas pr duction.

The next point to be considered by the Committee was whethe foreign goods of the class or description to which the application r lated were being imported into, and retained for consumption in, t United Kingdom in "abnormal" quantities. He thought it cou be said that practically the whole of the foreign mantles that can to this country were retained for home consumption. Foreign mantl only entered into the export trade of this country to a negligib degree; British manufacturers held what export trade there was, ar they were enabled to do this by reason of the preference which w granted to British-made goods by the Dominions. The important wo in this part of the instructions to the Committee was "abnormal. He believed it had been suggested as a general test that the relati home and foreign trade in the goods, in respect of which an impo duty was sought, before the war should be regarded as normal. I claimed, however, that pre-war conditions so far as gas mantles this country were concerned were not conditions of fair competitio The trade in gas mantles was then dominated by Germany, who h secured the control of the monazite sands. He suggested that t standard for the normal quantity of sales of home-manufactur mantles should be determined by reference to the importance of t article. If the Committee could be satisfied that the gas mantle w an article of national importance, then the home manufacturers shou have high percentage of the home trade. If it were found that t home manufacturers were in jeopardy through the volume of import and were only retaining a portion of their business by selling mantl at unremunerative prices, then he submitted that imported mantl were being retained in this country for home consumption in "abno mal" quantities. The percentage of sales held by British manufa turers was steadily falling, and during the last three months it h declined to an alarming extent.

The next question for the Committee was whether the foreign goo so imported were being sold or offered for sale in the United Kin dom at prices below those at which similar goods could be profitab manufactured or produced in the United Kingdom. He submitte that the Committee had to determine total competition, and not isol ted instances. To the average prices shown by the Customs retur there should be added a small amount in respect of the duty levied the thorium contents, and allowance must be made for the cost clearance from the docks to customers' warehouses. The addition respect of these two items was about 1s. or 1s. 6d. per gross.

The Committee had also to decide whether such exceptional compe tion came largely from countries where the conditions were so di ferent from those in this country as to render the competition unfai The Incandescent Mantle Manufacturers' Association made their co plaint against four Continental importing countries—namely, Ge many, who were the principal competitors, and whose imports can in at the highest price; Poland, formerly a small competitor, b whose exports to this country were increasing in volume; and Aust and Italy, whose volume was comparatively small, but whose pric were lower than those of the other two countries. The Associati were informed, and believed it to be a fact, that it was to expect t importation of some two million mantles from Italy during the ne season. These were countries in which depreciation of currency h taken place two or three years ago, and where the currency had no become stabilized; but the depreciation which had occurred had le a permanent mark on the state of affairs in those countries, and ga the foreign manufacturer an advantage over his British competito particularly as to overhead charges. A more tangible ground f complaint against unfair competition was concerned with the inferi conditions of employment of labour, particularly in regard to wag The highest Continental figures for wages were 50 p.ct. below t wages paid in British factories. Lower wages also had an effect the price of raw materials, because the raw materials used in t mantle industry were the finished products of other industries, which the cost of labour entered very largely. Foreign competito were able to obtain their nitrate of thorium and other goods requir for manufacturing mantles, in the majority of cases, at prices lowe and in some cases considerably lower, than the prices paid for simil goods by British manufacturers.

The Committee were entitled to consider whether the industry in th country was being carried on with reasonable efficiency and econom Regarding this point, Mr. Soper referred to the evidence given the previous inquiry in this connection, as the result of which a du was imposed on foreign mantles under Part II. of the Safeguardin of Industries Act, 1921, and said that British manufacturers were no

etting a substantial increase in output per worker per hour, as ompared with the output at the time of the previous inquiry.

Then the Committee were entitled to consider whether the imposi- on of a duty on gas mantles would exert a seriously adverse effect n employment in any other industry using goods of the same class n production. The only way in which a duty on mantles could affect nother industry would be that, if the cost of mantles were seriously aised, it might raise the cost of lighting in factories where gas was sed as an illuminant; but, whatever duty was placed on imported nantles, it would not have that effect.

Finally, the Committee were asked to express an opinion as to whether the applicant industry had established a claim to a duty, and, so, what rate or rates of duty would be reasonably sufficient to ountervail the unfair competition. In this connection Mr. Soper ubmitted that a flat rate on mantles would be preferable to an *d valorem* duty.

With regard to employment, a table showed that the number of orkers employed in this country each week totalled over 3000 roughout 1920, and in the last quarter of 1921 there were 2230. The gure had dropped to 1211 in the second quarter of 1922; in the last uarter of 1923 there were 1979; and in the last quarter of 1924, 1760. When the duty on imported mantles came off, employment was re- uced, and the number employed at the end of April this year was bout 1540. These workers were employed directly in mantle manu- acture. It was difficult to estimate how many were employed in- irectly, but Mr. Soper produced a table showing the principal raw naterials used, and indicating the extraordinary ramifications of the ndustry and the indirect employment afforded.

The CHAIRMAN said one could not regard the mantle industry as one of the leading industries of the country.

Mr. *Soper* said it was not put forward as such. The Association egarded it as one of national importance, however, having regard to he nature of the goods produced.

The CHAIRMAN asked why it was of national importance that con- umers should be able to buy British mantles. If they could get them heaper from abroad, why should not they?

Witness said that, when war broke out, the industry was unable o supply either its own raw material or the finished mantles which he country required; and a very serious state of affairs had arisen, which served to emphasize the national importance of the industry.

It was essential that the industry should be maintained in such a state that it could supply the whole needs of the country in a time of emergency. The total sales of British mantles, less exports, between the years 1920 and 1924, showed an average annual sale of about 430,000 gross. Also, better mantles were being made every day, and they lasted longer than those made previously. The condition of industry affected the gas mantle industry, because a substantial number of mantles were used in factories. In support of the view that the gas mantle industry was not a dying industry, he said that statistics showed that the number of street lamps using gas in the country had increased from 697,000 in 1919 to 719,000 in 1924—an increase of over 20,000. The number of consumers of gas had increased in the same period from 8 millions to 8¼ millions. This showed an increasing demand for gas for lighting, as well as for other purposes. In the same period there was an increase of 336,000 users of slot meters, showing an increase in the use of gas among the poorer classes. Again, sales of gas lighting appliances had been increasing continually during the last two or three years. Another point which had a bearing on the demand for gas mantles, *qua* mantles, was the installation of clusters of lights in street lamps in place of a single light; and there appeared to be an increasing tendency to instal this system of lighting.

In reply to Sir John Barran, witness said that, if British mantles ceased to be made, the effect would be prejudicial to the production of gas in this country, and to the production of valuable products obtained from gas manufacture; because, if no gas mantles at all were available, gas as now manufactured would be useless as an illuminant.

Sir JOHN BARRAN said the Committee would want to know whether the gas could be used up in its entirety for cooking, even if it were not used as an illuminant.

In answer to a question, Mr. Soper said he did not think a duty would materially increase the price of mantles to the consumer, because he was not at present getting the advantage of the low prices of imported mantles. It was not proposed to offer evidence as to the control of export prices in Germany, which was an important matter at the previous inquiry, because there was no price association in Germany at present, and German manufacturers were importing independently, so far as he knew.

The Committee adjourned until Friday, May 22.

CAPETOWN AND DISTRICT GAS LIGHT AND COKE COMPANY, LTD.

Dividend Maintained.

The Thirty-Fifth Ordinary General Meeting of the Company was eld last Wednesday at the London Offices, No. 38, Grosvenor Gar- lens, S.W.—Mr. H. R. SAVORY (the Chairman) presiding.

The SECRETARY (Mr. R. W. Blackburn) read the notice convening he meeting and the Auditors' report; and the Directors' report and he statement of accounts for the year to Dec. 31 were taken as read.

The CHAIRMAN said that the year 1924 opened with rather better prospects for general trade in Capetown than previously, and busi- ess continued to improve for the first three months; but after- wards general trade declined, and it was not until near to the close of the year that there were any signs of improvement.

AN INCREASED PROFIT.

It was gratifying to the Directors that the report and accounts which hey submitted for approval that day might be considered satisfactory. The result of the year's working showed an increase in income and an increase in profit. The increase in income was not a large one; and the increase in profit was mainly due to economies in general working. The Company had had a full year of the use of the No. 2 installation of vertical retorts, through which 13,010 tons of South African coal had been carbonized. A saving of 1228 tons of coal had been made, and a larger output of gas had been obtained—14,884 c.ft. per ton. The decrease in coal used had resulted in a saving of £3220 in the cost of coal for last year. The coal used produced a good volume of gas, and the yields of coke and tar were fairly adequate.

REVENUE ACCOUNT.

Comparing the revenue account with that of the previous year, expenditure on manufacture and distribution had decreased £3125; the cost of repairs and maintenance of works, plant, and mains had been reduced £1141. These, with other smaller economies, resulted in a reduction of total expenditure of £3883. On the revenue side of the account, revenue from the sale of gas and rentals of meters, cookers, geysers, and other fittings showed an increase of £1302. Sales of fittings were £216 higher; but sales of residuals were less by £475. The profit for the year was increased by £4553—a result which might be regarded with satisfaction. The increase in the quantity of gas sold was equal to 1'3 p.ct., there having been a better demand for gas by the users of prepayment meters. On the other hand, sales of gas by ordinary meter and those to large consumers for industrial purposes were slightly reduced. This was due to the closing-down of several of the canning factories for many months, and also in some measure to the British Empire Exhibition at Wembley attracting visitors from Cape Town.

RESIDUALS.

The coke sales increased by 15,099 bushels last year; but the average price obtained was not quite so good—being 2d. per bushel below that of the previous year. Sales of tar were lower than in 1923, less tar having been made, owing to the smaller quantity of coal carbonized. But all the tar made was sold. The average price obtained for tar was less by ½d. per gallon. It was necessary to reduce prices of both these residuals, in order to compete with the import prices.

DISTRIBUTION.

There were 5873 yards of mains of various sizes laid last year—principally at Sea Point, at Green Point, and at Pinelands Garden City, enabling new properties to be connected and fitted for supplies of gas. Continuous and systematic search for faults in mains and services was carried on, and many repairs were executed. Gas for cooking and heating increased in popularity, and 249 new consumers were added during the year. The average value of ordinary meter consumers' accounts was less by 1s. 4d. than in 1923; but the average receipts by prepayment meters increased by 2s. 11½d. per meter. The policy of the removal of the showroom and offices into the business quarters of the city continued to be fully justified; increased numbers of cookers, stoves, geysers, and other fittings having been sold. The Company's system of propaganda for making known the various uses of gas by means of advertisements, posters at railway stations, and lectures with cookery demonstrations, had been steadily pursued. These demonstrations were so well attended that on some occasions the accommodation was insufficient for all those persons who wished to be present. The Pinelands Garden City Estate had been linked with the Company's mains by 6-in. pipes, and by the end of last year 66 houses had been connected and supplied with gas. They were now in a position to connect the new houses as erected; and the demand for houses continued to be brisk.

PROSPECTS.

Mr. Blackburn, a member of the Board, visited the Cape in the autumn of last year, and would presently give them an account of the conditions he found existing at Cape Town, and an indication of what were the prospects for increasing business by future extensions. As to the outlook for the current year, a steady increase in the number of consumers was being obtained. The working of the plant was very satisfactory, and the capacity amply sufficient to supply any increased demands. Applications for supplies of gas were being received and dealt with. It could not be expected that they would be able to continue indefinitely to make further large economies in the cost of working. They must look to increasing the number of their consumers, and to giving satisfaction to them, in order to maintain and increase revenue; and in this the additions to the mains already made, and those to be made this year, should be of very considerable assistance. He concluded by moving that the report and accounts be adopted, and that a final dividend of 4 p.ct., less tax, making, with the interim dividend already paid, 7 p ct. for the year, be declared on the ordinary shares.

MR. BLACKBURN'S ACCOUNT OF HIS VISIT TO SOUTH AFRICA.

Mr. R. W. BLACKBURN, in seconding the resolution, said that in view of his visit to Cape Town last year, it might be of interest if he touched as briefly as possible upon some aspects of the Company's business. The Chairman had told them that the manufacturing plant was now ample to meet all possible demands for some years, and that, although the output of gas had increased, some 1200 tons of coal were saved during the year—the average gas made improving to nearly 15,000 c.ft. per ton of coal carbonized. The calorific value of the gas supplied was not sacrificed in order to obtain this result. It was maintained throughout the year well above the Company's statutory standard, with a total absence of complaints. Now, in dealing with these results, it was fair to have regard to the fact that they had been obtained under what in this country would be termed somewhat adverse conditions. They used South African coal exclusively. Analyses of this coal showed a volatile content of some 30 p.ct. below that of a good average English coal, and an ash content very much higher. The coke produced, though of excellent quality, was subject to somewhat rapid attrition; and the tar yield also was not high. These factors, of course, affected the revenue from residuals. Coal had to be freighted by rail nearly 1000 miles, and during this long

transit a certain percentage was lost through windage and shaking. Notwithstanding these disadvantages, and the fact that residuals at Cape Town, in common with the rest of the world, commanded lower prices during the year, nearly 66 p.ct. of the cost of coal carbonized was recovered from the sale of residuals; and this, they would agree, reflected credit on the Engineer responsible for the working of the Company's plant. The improvement in working was more marked during the latter half of the year. He would add that, although the average results, compared with the previous year, were relatively good, this did not preclude the Board from expecting some further improvement during the current year.

CONDITIONS AT CAPETOWN.

Now to come to what at the present time was highly important—distribution. The conditions in which gas had to be supplied at Cape Town were very different from those obtaining here. Density of population was very much less. The majority of houses built were of the detached type, situate well back from the roads; and though from a residential aspect this offered advantages, it had disadvantages from the point of view of gas supply, and expenditure necessary in connecting-up new consumers. They would, perhaps, more readily realize the scattered nature of the districts served when he told them that the Company now had in Cape Town and suburbs over 120 miles of mains in operation, supplying some 6200 odd consumers. Building was proceeding apace. Electrification of the railways was projected, and new districts are rapidly being opened-up; and if advantage is to be taken of these opportunities, if the Company's business is to expand, and to continue to progress satisfactorily, it is obvious that they are faced with very considerable further expenditure. The question of extensions was one of the several important matters which necessitated his visit to Capetown last year when the whole position of the Company's business, its prospects and possibilities, were exhaustively reviewed. As a result, a definite policy had been formulated, and within the limits of their resources was being carried out. From the closer, and, he hoped he might say, very cordial co-ordination established in the Company's affairs, the Directors were reasonably expecting in the near future considerable further improvement of business on the distribution side. He was particularly pleased with the design and lay-out of the showrooms. They were situate in an admirable position, in one of the two best business thoroughfares in Cape Town. They had heard from the Chairman that 249 new consumers were obtained during the year. He would amplify this by telling them that 468 gas cooking appliances, 222 geysers, and 46 gas fires were installed in 1924. The demonstration of gas appliances, &c., at the showrooms had undoubtedly proved of great benefit, and had helped also in regard to the development of gas for industrial purposes. This latter branch was being systematically pushed. They already had some very considerable new consumers; and the prospect of further good business was encouraging. In these times he would not care to risk any prophecy. He thought, however, from what he had said they would agree that signs were apparent which pointed to steady progress—with this proviso: That the Union of South Africa, and more particularly Cape Town, as affecting the Company's activities more closely, remained free from further ill-advised industrial disturbance of trade and commerce, such as the strike which held up all business in the building and allied trade for over two months during his visit.

ADMINISTRATION.

From the accounts before them, it would be seen that the position was very healthy, compared with even a few years back. He wished to emphasize one important point. They had not made any capital borrowing during the year to meet the cost of extensions. This cost had, up to the present, been financed out of income. They would see from the balance-sheet that cash in hand at Dec. 31 last, amounted to in round figures £5000—just about sufficient to meet accrued interest on debentures payable on Jan. 1 of this year. They had spent to the limit of their resources. There was no margin; and in this fact, he thought, lay the answer to what he might be permitted to call the somewhat pointed inquiries which he had received from several shareholders on the question of dividend distribution. It was, of course, obvious that, but for the expenditure on extensions to which he had alluded, a larger distribution on the ordinary shares than the one now recommended would be possible. The Directors were very considerable shareholders; and Mr. C. W. Lilley controlled what was by far the largest individual shareholding in the Company. They would all be pleased to receive a higher rate of dividend; but, after very careful consideration, it was clear to the Board that what might be termed a conservative policy in this respect must be adhered to during such time as extensions had to be dealt with out of income, and until the period arrived when this outlay bore fruit. The aim had been to pay a dividend which could be counted upon as stable, not liable to fluctuations—at any rate, not to fluctuation in a downward direction—and the dividend of 7 p.ct. now recommended was in accordance with this policy. It was one which he hoped they would thoroughly endorse. During his stay in Cape Town, he, of course, came into every-day personal contact with all grades of the employees. He took this opportunity of acknowledging the keen interest shown in all that could assist the progress of the business by the Local Consulting Director, Dr. Bennie Hewat. He was a gentleman who was very conversant with all Union conditions, and particularly with local affairs at Cape Town; and in any matter likely to affect the Company's interests he was always available for consultation and advice. Their Cape Town Auditors have acted for the Company for a very long period, with entire satisfaction to the Board. Their checking and audit of the accounts there was very thoroughly carried out, and he would like to say that their Chairman (Mr. E. R. Syfret) was of very considerable assistance to him in some important matters of the Company somewhat outside the usual scope of his firm's services. For this he was personally extremely indebted to him, Mr. Syfret; and the Board very much appreciated it. In concluding, it was fitting that he should pay a tribute to the good work during the year under review of the General Manager, Engineer, Distribution Superintendent, and their respective staffs at Capetown and Woodstock. The aim, and endeavour, of a public utility undertaking such as theirs was, should be to supply the public it served with gas and residual products of excellent quality, coupled (equally as important) with efficient and courteous service. As a result of attention to this policy, the undertaking now enjoyed, and deservedly enjoyed, a high repute. Such a standard could not have been attained, and it certainly could not be maintained, without the energy, the zeal, and above all the loyal co-operation displayed by the Company's employees; and he was pleased to be able to report, from personal observation and from other sources available to him, that the business was so capably and so loyally served by its responsible officials and the general staff.

Mr. A. R. Burch said that, as an old Gas Engineer, he would like to endorse what Mr. Blackburn had told them with regard to the difficulty of making gas out of what was really steam coal, instead of gas coal. Had the Board ever investigated the possibility of obtaining coal from Australia? The conditions described by Mr. Blackburn revealed an excellent field of high-pressure distribution, which meant a smaller outlay on mains. As to the dividend, the price charged for gas was high; and the great object should be to decrease it in every way possible.

Mr. E. Nicholls regarded the report as exceedingly satisfactory. The policy of sending out Mr. Blackburn to inquire into things on the spot was very much to be commended; and if this plan was followed from time to time, so as to keep in closer touch with affairs out there, it would be an advantage.

Mr. A J. Kingdon asked what was the total quantity of gas sold during the year. He congratulated the Directors on the report and accounts, and trusted they would continue the wise policy of augmenting the reserve fund until the Company was placed in a strong financial position.

Mr. Whittaker inquired as to the percentage of unaccounted-for gas.

Mr. Blackburn replied to these questions, and to one or two remarks regarding the accounts. He said the Company had at the present time no capital available for undertaking high-pressure main extensions. The extensions which were being undertaken at the present time were those which came within the radius of existing mains. The manufacturing plant was ample; and it was only by increasing the consumption on the existing mains that they could hope for augmented profits. The total sale of gas was 155 million c.ft. in round figures. They had spent over £9000 on extensions during the year; the bulk was on distribution account. Gas unaccounted for per mile of main was, he thought, fairly comparable with that of any gas undertaking he knew of—200,000 c.ft. The sudden variations of temperature in Cape Town had to be taken into consideration in this connection.

The resolution was then put to the meeting and unanimously carried.

Mr. C. W. Lilley proposed the re-election of Mr. Blackburn as a Director. He pointed out that Mr. Blackburn had been appointed to the Board while acting as Secretary, which position he had filled for many years. When he became a Director, it seemed to the Board very desirable that his great knowledge and experience of the business should be utilized in a visit to Cape Town. From this visit the Board hoped to get good results in the future, as he believed they had done already.

The Chairman seconded the motion, which was agreed to.

The Auditors (Messrs. Kemp, Chatteris, Nichols, Sendell, & Co.) were, on the proposition of Mr. Kingdon, seconded by Mr. Whittaker, reappointed, at a fee of 100 guineas, in place of 80 guineas as heretofore; and the proceedings terminated with votes of thanks to the Chairman, Directors, and staff, both in this country and South Africa, for their excellent services to the Company.

Shrewsbury Gas Light Company.—At a meeting of the Shrewsbury Town Council last week, Mr. L. Jackson moved the following resolution: "That the Council is of opinion that in the interests of the townspeople, the undertaking of the Shrewsbury Gas Light Company should be the property of the Corporation, and instructs the Finance, General Purposes, and Parliamentary Committee to bring up a report to the Council on the matter at the September meeting of the Council."

Discontinuance of Public Lighting at Hereford.—The Hereford Town Council have decided to discontinue the public lighting during the summer, with the exception of twelve 1500 c.p. lamps situated in the principal squares and at dangerous corners. These will be lighted from dusk till dawn. The cluster burners in 24 sewer lamps will be plugged-up, with the exception of one nozzle in each lamp. One No. 2 nozzle in each sewer lamp will be kept alight (with mantle) night and day, primarily for sewer-gas extraction purposes. The discontinuance of the bulk of the public lighting is from May until the first week in September, when the lamps will again be lighted from dusk till midnight.

Progress at Spalding.—Reference was made in the Spalding Urban District Council, by the Chairman of the Finance Committee, to the continuous progress of the Gas Department. The make during the past financial year, he said, was 80,282,000 c.ft., which was an increase of 3,450,000 c.ft. over the previous year; and this, bearing in mind the steady rise in output over the preceding four years, was very gratifying. The system of selling gas cookers by hire-purchase, which had been adopted on the suggestion of the Manager (Mr. R. J. Calderwood), has proved very successful; and much is hoped from the fine new showrooms. The Chairman cited the reasonable charge for gas—large consumers for power purposes can obtain it at 3s. per 1000 c.ft.—as proof of the admirable way in which the gas undertaking is managed.

STRETFORD AND DISTRICT GAS BOARD.

n exhibition and series of cookery demonstrations has recently held at the Public Hall, Urmston.

he Chairman of the Board, Councillor R. J. M'Beath, J.P., ., in opening the exhibition on May 4, said that the object was ive the consumers of the district an opportunity of obtaining in- ation how to make the best use of the gas supply in their homes. e the Board took possession of the gas-works at Stretford, the ber of cookers in use in the area had increased from 4700 to ly 8000, and the number of fires from 3000 to 3700. The total made in the last complete year prior to the Board's possession of works was 518¾ million c.ft.; and for the year ended March 31 700 millions had been manufactured. Gas used for industrial pur- s has increased from 114 million to 166¼ million c.ft. In order ring special patterns of highly-finished cookers, fires, water- ing apparatus, and wash boilers within the reach of all con- ers, the Board had introduced a hire-purchase system. uring the run of the exhibition Miss H. H. Tuxford, M.C.A., demonstrations in cookery by gas; and the visitors benefitted he instruction and help given.

TRADE NOTES.

srs. Firth Blakeley, Sons, & Co.

This firm have published a booklet in which are illustrated some he plant they manufacture. Several of the photographs refer to rent types of gasholders.

rection.

In our "Trade Notes" last week a new catalogue issued by srs. W. C. Holmes & Co., Ltd., was mentioned. In this reference made to the Wikner system. Unfortunately the name Wikner mis-spelt.

erro-Concrete Structures for Gas-Works."

This is the title of an illustrated booklet recently issued by the . Construction Company, Ltd., of Derby, which contains particu- and photographs of some of the many contracts which the firm successfully carried out.

m Dryers.

Messrs. James Gordon have published a new leaflet dealing with Massip steam separator or dryer. Thousands of these separators at work, and they have been adopted largely in this country by ing engine builders, such as Messrs. Sultzer, Bros., John Mus- e & Sons, Ltd., and Galloways, Ltd. These appliances are of ish manufacture throughout.

ent Fondu.

The Lafarge Aluminous Cement Company, Ltd., of Lincoln se, Nos. 296-302, High Holborn, W.C. 1, have published an resting booklet dealing with their special product, Ciment Fondu, h is a high-aluminous cement giving extremely high compression ngth at twenty-four hours. The pamphlet gives comprehensive concerning its discovery, qualities, and its fundamental difference Portland cements. It also indicates cases where much time t be saved, and reduction in costs effected, by its use. The phlet will serve as a handy little book of reference for engineer, ractor, and architect.

CONTRACTS OPEN.

.

The Gas Committee of the Sutton-in-Ashfield Urban District ncil are inviting tenders for the supply of 8000 tons of gas coal. advert. on p. 618.]

The Newbury Corporation Gas Undertaking are inviting tenders South Yorks. and Derbyshire gas coals for a period of twelve ths. [See advert. on p. 618.]

The Council of the Urban District of Spenborough are inviting ers for the supply of about 20,000 tons of screened gas coal or for their Cleckheaton and Heckmondwike Gas-Works. [See rt. on p. 619.]

The Hebden Bridge and Mytholmroyd Gas Board are inviting ers for the supply of 7000 tons of gas nuts. [See advert. on p. .]

The Gas Department of the Clacton-on-Sea Urban District ncil are inviting tenders for the supply and delivery of 6000 tons st screened gas coal. [See advert. on p. 618.]

rts (Horizontal and Vertical), **Retort Houses, Coal and Coke Handling Plants, &c.**

Tenders are invited by the Gas Committee of the Manchester oration for horizontal and vertical retort installations, retort es, and coal and coke handling plant, &c. [See advert. on p. 618.]

fiers, Connections, &c.

The Gas Committee of the Manchester Corporation are inviting rs for purifiers, connections, and lifting apparatus. [See advert. 618.]

Reduction in Price at Sedgley.—The Sedgley Urban District ncil have decided to reduce the price of gas commencing with the nt quarter. The charges will now be 4s. per 1000 c.ft. to ary consumers, and 16 c.ft. per 1d. for slot consumers.

Croydon Gas Company's Co-Partnership.—The report of the Co- nership Committee for the year ended March 31 last has been d. The bonus is at the rate of 6½ p.ct. (the same as for the ous year), being the average rate at which dividend was paid on liding-scale stock of the Company for 1924. Up to March 31, the inception of the scheme, in 1909, 1541 co-partnership agree- s have been entered into, and 660 have terminated, leaving 881 in .

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

By almost common consent, the past week has been the worst so far experienced, at all events, as far as Durham is concerned. Northumberland steams were weaker all round, and in most cases about sixpence lower than in the previous week. There appeared to be no interest in Durhams at all, and it was more a question of entire absence of demand than of price.

Production will be curtailed this and next week owing to Whitsun holidays, but it seems extremely doubtful whether this will affect the position at all. Inquiry is entirely lacking, both for prompt and forward shipment.

Wear Specials and the best quality gas makes are quoting 19s. f.o.b., but few are in a position to hold out for this price except by working short time. Seconds are 16s. 6d. to 16s. 9d. Unscreened coking is an extremely weak market, and best sorts are obtainable at 16s. 9d. to 17s. Best Durham bunkers are offering at 17s. to 17s. 6d. But, as already stated, there does not seem to be enough trade at any price, and, even at these lower levels, collieries are faced with idle time, and more and more notices are being given on all sides. Still, some sections of the miners at the delegate conference last week were in favour of proceeding with additional wages demands, though it is true they were in a minority. The policy of the less optimistic majority appears to have been to hold on to what they have got as long as they can. But more than this will have to be done to reduce our costs to a competitive level.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

There is no material alteration in the Yorks. and Lancs. coal market this week. The irregular working of collieries is likely to continue, partly because of the lack of export business which in normal times relieves the market of superfluous screened coal.

The industrial outlook continues black, and the position is worse than it was some months ago; the iron and steel trades being particularly affected. As a result, many collieries have on hand stocks of the smaller grade fuels; and these are being offered at discounted figures without apparently bringing about the desired results. Consumers have difficulty in taking even their limited contract deliveries.

Gas coals continue to be inquired for under contract for delivery over twelve months beginning either in July or August, and the general attitude of producers appears to be one of uncertainty. Figures for the same class of coal vary at different points in accordance with the local situation.

The shipping outlook shows no improvement; and should the present situation continue, there will be a serious financial proposition for the collieries to consider in view of the larger outputs which Germany is producing and selling to customers who previously took British coal.

The following are the Humber bunker and export prices (f.o.b. usual shipping ports): South Yorkshire—Hards, Association, 20s.; screened gas coal, 18s. to 18s. 6d.; washed trebles, 19s. 6d. to 20s.; washed doubles, 17s.; washed singles, 16s.; washed smalls, 11s. 9d. to 12s. 3d.; unwashed doubles, 16s.; rough slack, 10s. to 10s. 6d.; smithy peas, 19s. to 20s. per ton. West Yorkshire—Hartleys, 17s. to 18s.; screened gas coal, 17s. 6d. to 18s.; washed trebles, 18s.; washed doubles, 16s. to 17s.; washed singles, 15s. 9d. to 16s. 3d.; washed smalls, 11s.; unwashed trebles, 17s. to 17s. 6d.; unwashed doubles, 13s. to 14s.; rough slack, 10s.; coking smalls, 8s. 6d. to 9s. per ton. Derbys and Notts.—Top hards, 20s.; washed trebles, 17s. to 19s.; washed doubles, 16s. 6d.; washed singles, 15s. 6d.; washed smalls, 11s.; unwashed doubles, 14s. to 15s.; rough slack, 10s. to 10s. 9d. per ton. Yorks, Derbys, and Notts.—Screened steam coal, 15s. to 17s.; gas coke, 20s. to 21s. 6d.; furnace coke, 15s. 9d. to 16s. 9d. per ton.

The highest classes of Lancashire slack are selling at from 15s. to 17s. per ton at the pits. Industrial coal is 21s. per ton at the pits.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

The anxiety of collieries to keep down stocks results in the market being inundated with supplies—offered in many cases at prices appreciably lower than those previously ruling. Endeavours are being made to impress householders with the advantage of filling their cellars at these low rates. Very little success attends these efforts, however. Last year, when the buying of domestic supplies for the winter was accelerated in some measure, householders who procrastinated had to pay for their indecision, the rush of demand which followed the holiday season giving a sharp impetus to prices. It is difficult to enforce the lesson, however, in the present glutted state of the market. Bakers' nuts can be bought at the normal price of good slack. All grades of industrial fuel reflect market deterioration. It is a common complaint that wagons are not earning anything like sufficient to make ends meet. In the circumstances which prevail, long railway hauls represent such a disproportionate ratio of cost that pits remote from the big centres of consumption are very badly hit. It is these that are cutting the prices so severely. Even the more favourably placed collieries, which have been comparatively well employed, are now retarding the rate of output. More contracts for gas coal supplies over the coming year have been fixed up. Some of the undertakings are attracted by the expedient of balancing the arrears which have to be made up on current contracts with the low-priced spot lots that are being offered; but the question of storage presents a formidable obstacle. Generally "safety first" is the ruling factor. The market continues over-supplied with both gas coke and furnace coke, with the inevitable effect on values.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *May* 25.

Pitch is nominal at 41s. to 42s. per ton. There is a certain amount of inquiry developing for next season's shipment, but makers are disinclined to sell at present low levels.

In the meantime chief interest is concentrated on road tar, which is being delivered in large quantities.

There is more inquiry for creosote, and the price is steady at about 7d. to 7½d. per gallon net and naked at works.

Pure benzole and pure toluole remain unchanged at about 1s. 11d. to 2s. per gallon.

Solvent naphtha is firm at 1s. 8d. to 1s. 9d. per gallon for 95-160 quality.

Tar Products in the Provinces.

May 25.

Tar products markets are generally unchanged and quiet, and there is very little inquiry for either prompt or forward delivery. So far as pitch is concerned, shipments appear to have ceased for this season. As regards business for next season, prices are so low that there is no inducement to manufacturers on this side to sell. So far as buyers on the Continent are concerned, they appear to be quite willing to wait unless they can get on at something like the equivalent of 40s. a ton f.o.b.

Creosote continues quiet; but there is a steady demand, and it is generally thought that some improvement in price will take place when the export demand improves, which it is expected to do about the turn of the half-year.

Water-white products are steady, and there is still a good demand for solvent naphtha.

Crude carbolic and cresylic continue dull, and there is little or no business passing.

The average values for gas-works products during last week were: Gas-works coal-tar, 26s. 3d. to 31s. 3d. Pitch, East Coast, 40s. to 41s. f.o.b. West Coast—Manchester, 35s. to 36s.; Liverpool, 36s. to 37s.; Clyde, 39s. to 40s.; Benzole, 90 p.ct., North, 1s. 7½d. to 1s. 8½d.; crude, 65 p.ct. at 120° C., 11d. to 1s. 1d., naked at makers' works: 50-90 p.ct., naked, North, 1s. 7½d. to 1s. 8½d. Toluole, naked, North, 1s. 6½d. to 1s. 7½d., nominal. Coal-tar crude naphtha, in bulk, North, 7¾d. to 8¾d. Solvent naphtha, naked, North, 1s. 5d. to 1s. 6d. Heavy naphtha, North, 1s. to 1s. 2d. Creosote, in bulk, North, liquid, 5¾d. to 6d.; salty, 5⅝d. to 5¾d.; Scotland, 5¾d. to 5⅞d. Heavy oils, in bulk, North, 6½d. to 7d. Carbolic acid, 1s. 5d. to 1s. 6d. prompt. Naphthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality 2½d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

RATING AND VALUATION.

The New Bill.

The Government scheme for the amendment and simplification the law relating to rating and valuation has recently been issu Naturally, in view of the complexity of the subjects dealt with, measure is somewhat technical in character. It consists of seven eight clauses and nine schedules.

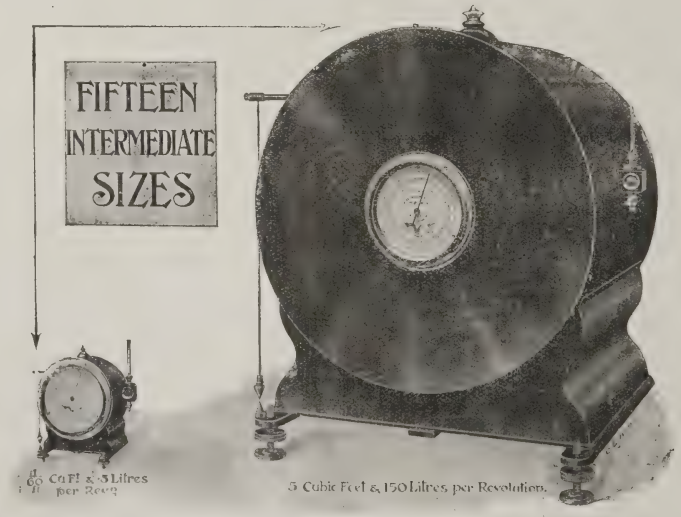
The main objects of the Bill are the simplification and improvem of the administrative machinery of rating and valuation and the moval of various anomalies; the substitution of a single valuati for the separate valuations at present required for purposes of rati and taxation; and the promotion of uniformity of valuation as a co dition precedent to any comprehensive review of the system of lo taxation and Exchequer grants. Parochial rating is to be abolishe the rating functions of overseers are to be transferred to town counc and district councils, and boroughs and urban and rural districts st stituted for parishes as rating areas. The appointment of overse will be discontinued, and all paid parochial officers will be transfer to the new rating authorities. Rates are to be consolidated. boroughs and urban districts a "general rate" will take the pl of the separate rates now levied; in rural districts there will be "general rate" levied by the rural district council over the wh district in place of the poor rate, and a special rate levied on ea parish chargeable with special expenses under the Public Health Ac or lighting expenses under the Lighting Act. Various amendme are proposed for the simplification of procedure in regard to the le ing, operation, incidence, collection, and compounding of rates.

As to the single valuation, it is proposed that, as is already case in the Metropolis, the values should be the basis for the asse ment of county as well as local rates, and that the gross val appearing in the valuation lists should be adopted for the purposes Schedule A of the income-tax. Inland Revenue officers will accoingly be concerned in the preparation and revision of the valuat lists. It is proposed that valuation areas should consist of (*a*) cou boroughs, and (*b*) county districts or combinations of such distri and that there should be one assessment committee for each ar Following the London precedent, the valuation list is to be renew every five years.

In accordance with the recommendations of the Inter-Departmen Committee whose report was issued in February, the Bill propos important changes in the matter of the rating of machinery. It provided that the following classes of machinery and plant are to deemed to be part of the hereditament:

1. Machinery and plant (together with the shafting, pipes, cab wires, and other appliances and structures accessory thereto) wh is used or intended to be used, mainly or exclusively, in conn tion with any of the following purposes: The generating, stori

LABORATORY METERS.



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transforming, or transmitting of power, heating, cooling, ventilating, lighting, draining, or the supplying of water to the land or buildings of which the hereditament consists, or any part of that land or those buildings, or the protecting of the hereditament from fire.

. Lifts and elevators.

. Railway and tramway lines and tracks.

.. Any plant or any combination of plant and machinery which is, or is of the nature of, a building or structure, including gasholders, blast furnaces, coke ovens, tar-distilling plant, cupolas, water towers with tanks.

With the above exceptions, no account is to be taken of the value of any plant or machinery, which will therefore be exempted from rating.

In the Bill the gas industry will find several matters which will have to receive the consideration and action of its central organizations.

Langley Mill Gas-Works Extension.

The Langley Mill and Heanor Gas Company, Ltd., are installing another large gasholder at their Langley Mill Works. This is to be erected close to the one installed a few years ago, and, like it, will have a capacity of 260,000 c.ft. The work of construction is being carried out by Messrs. Robert Dempster, Ltd., of Elland; and for the riveting special hydraulic plant has been laid down. An interesting ceremony took place recently, when Mrs. Andrews, wife of Mr. H. J. Andrews, Managing Director, put in the first rivet, and was presented with a gold-mounted umbrella as a memento by Mr. J. Earside, the Engineer-in-Charge.

Rotherham Corporation Gas Department.

The annual report of Mr. J. S. Naylor, the Engineer and General Manager, for the year ended March 31, shows that the quantity of coal carbonized during the year was 9291 tons, as against 6847 tons last year. The gas made was 124,628,000 c.ft. (623,140 therms), compared with 94,642,000 c.ft. (473,210 therms) last year—an increase of 29,986,000 c.ft. The quantity of gas purchased was 226,401,100 c.ft.—a decrease of 16,573,000 c.ft. The quantity of gas sold was 222,448,000 c.ft., an increase of 12,766,000 c.ft., or 4·12 p.ct. on last year's figures. This is mainly due to the increased demand for gas fires and cookers. The gross profit was £14,765, as against £16,956 last year. The net profit, after allowing for interest, redemption instalments, and contributions to sinking fund, amounts to £2459, compared with £4707. Owing to the reduction in the price of gas (4d. per 1000 c.ft.), which took effect at the beginning of last year, the saving to the consumers was £5374.

Sale of Nuneaton Gas Shares.—At the Peacock Hotel, Nuneaton, on May 19, Messrs. T. J. Chinn & Son sold by auction a number of shares in the Nuneaton Gas Company, the prices realized being as follows: 60 original £8 shares (7½ p.ct.), £6 10s. each; 50 new £8 shares (5¼ p.ct.), £4 10s. and £4 15s. each; and £100 of debentures, at £67.

The half-yearly report of the Matlock Bath gas undertaking shows a gross profit of £260, but a net loss of £365.

The Dewsbury Corporation Gas Department have made a net profit of over £7000 during the past year, despite the depressed condition of the residuals market.

A proposal was made at a meeting of the Brigg Urban Council that the Gas Committee consider reducing the price of gas. It was stated that, as new purifiers would have to be purchased, this concession could not be made.

In his annual report, Dr. W. A. Daley, Medical Officer of Health for Blackburn, refers to the fact that the average deposit of soot in the centre of the town is 48 metric tons per month, and states that an increased use of gas for power, lighting, and heating is necessary.

The Coventry Gas Committee have recommended to the City Council "that a scheme for the treatment of the effluent from the Foleshill Gas-Works be approved at an estimated cost of £15,000, to be paid from the reserve fund; and that an increased scale of charges be approved."

A dinner was given last Friday, at the Veritas Mantle Works, Wandsworth, by the Directors of Messrs. Falk, Stadelmann & Co., Ltd., to celebrate the winning by the Veritas Football Club First Team of a cup and medals for Group A, and a cup for the League Championship, Balham and District League, and by the Second Team of the runners-up certificate for Group C.

At the Ellesmere Port Gas-Works, on May 20, Mr. W.O. Parkinson and Mr. W. Stockton set in motion two engines for pumping gas into the holders at Little Sutton. The Ellesmere Port and Whitby Urban Council recently acquired the Sutton and Hooton Gas-Works, and the areas now supplied are Little Sutton, Great Sutton, Childer Thornton, Hooton, Eastham, and Willaston.

A verdict of "Accidental death" was returned at an inquest at Bristol on Thursday on Robert William Pratt, a stoker at the Thornbury Gas-Works, who died in the Royal Infirmary following an accident at the works. Evidence was given by Mr. Charles William Buckingham (the Manager) that the accident happened in the purifier house, where there were three boxes with lids removed by a traveling crane. To operate the crane, workmen had to get on the top of a box, and push it along. Witness heard a noise, and on going to investigate what had caused it, found that the crane had fallen over, and that Pratt was lying on his back between two of the boxes. Witness believed the accident was caused by deceased having pulled, instead of pushed, the crane, and not doing it squarely made it topple over. He had been instructed as to how to use it. Witness admitted that there was no first-aid equipment at the works; and in returning their verdict, the Jury expressed the opinion that such appliances should have been provided.

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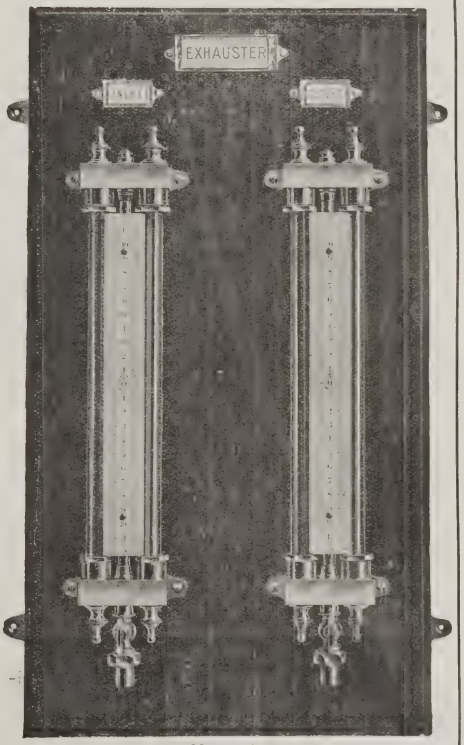

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STOCK MARKET REPORT.

On the Exchange last week there were signs that business was a little more active, influenced doubtless by the improved monetary outlook. As we anticipated, the London County Council issue did not attract the public, and 75 p.ct. was left with the underwriters. Frantic efforts are now being made to unload both the Council and the New Zealand loans, and several boosting paragraphs have appeared in the financial Press. Quite another proposition is the New South Wales issue of £6,500,000 5 p.ct. loan at 98½ p.ct., which was underwritten on Friday last, and for which it is expected there will be an enormous demand. Gilt-edged stocks were firmer. The result of the miners' conference has had an improving influence on the Home Rail Market, although the reduced traffic returns are not encouraging.

On the whole Industrials were quiet. The proposed modification of the Silk Duties brought about a recovery in Courtaulds, British Celanese, and Grouts. Iron and Steel issues were stimulated by the excellent report of the Tata Company, and Armstrongs improved on increased business reports.

The Gas Market was distinctly disappointing. It was thought that prices had steadied; but, as will be seen by the Table, all the changes in the quotations were on the downward grade. Ignoring the big *ex* div. drop of 27 points in the Imperial Continental Capital Stock, the principal reductions were the Brentford "A" and "B" stocks, which are now quoted at 95-100, a drop of 2½ points, the South Suburban 5 p.ct. ordinary at 95-98, a drop of 3 points, and Tynemouth 74-76, a drop of 3 points. The fall in the South Suburban stock is doubtless due to the proximity of the announcement of a reduced standard price.

An issue by tender of £30,000 6 p.ct. Irredeemable Preference Stock at a minimum of par is announced by the Lea Bridge District Gas Company. There should be a good demand for this stock.

The following transactions were recorded during the week:

On Monday, Bombay 5½ *ex* div., Brentford "A" 95, European 7, Gas Light and Coke 83¼, 83⅜, 83⅝, 83¾, 84, 84⅛, 4 p.ct. preference 78½, 3 p.ct. debenture 60⅜, Imperial Continental 182½, 183½, Ottoman 2s. 6d., Primitiva 9s. 3d., 9s. 6d., South Metropolitan 93¼, 93⅜, 93⅝, 93¾, 6½ p.ct. debenture 103, South Suburban 5 p.ct. debenture 98, 98½, Tottenham "B" 96½. Supplementary prices, Ottoman 7 p.ct. preference 58, Tottenham 5½ p.ct. preference 104¾.

On Tuesday, Alliance and Dublin 66⅛, 66¼, 66½, 4 p.ct. debenture 66⅜, 66½, Brentford "A" 95, British 4 p.ct. debenture 76, Commercial 4 p.ct. 87½, Continental Union 35⅝, 36, Gas Light and Coke 83¼, 83½, 83⅝, 83¾, 84, 84⅛, 4 p.ct. preference 78⅝, 79, 3 p.ct. debenture 60⅛, 60¾, 61¼, Imperial Continental 182½, Primitiva 9s., 9s. 1⅛d., 9s. 6d., 4 p.ct. debenture (1911) 64⅜, 65¼, South Metropolitan 93½, Tuscan 22s. 6d. Supplementary prices, Wandsworth 3½ p.ct. new 95, 5 p.ct. preference 95, 4 p.ct. debenture 77.

On Wednesday, Bournemouth "B" 12⅜, Brentford 4 p.ct. debenture 78, 79, British 112, 112½, Commercial 87½, Continental Union 36, Croydon maximum dividend 82¼, 83½, Gas Light and Coke 83½, 84, 84⅛, 84½, 3½ p.ct. maximum 63¼, 63⅝, 64⅜, 4 p.ct. preference 79½, Imperial Continental 182, 3½ p.ct. debenture 73, 73½, Primitiva 9s. 3d., 9s. 6d., 4 p.ct. debenture (1911) 64⅜, South Metropolitan 93⅛, 94, Tottenham "B" 97. Supplementary prices, Tottenham 5½ p.ct. preference 104½, 104⅝.

On Thursday, Bournemouth "B" 12⅜, Brentford "A" 95½, "B" 95, British 110, 111, Continental Union 36, Gas Light and Coke 83⅜, 84⅛, 84½, 3½ p.ct. maximum 63¾, 4 p.ct. preference 79, 79½, Hastings and St. Leonards 3½ p.ct. converted 76, Imperial Continental 155, 155½ *ex* div., Primitiva 9s. 3d., 9s. 6d., 4 p.ct. debentures 80⅜, 81, 4 p.ct. debenture (1911) 65¼, South Suburban 95. Supplementary prices, Wandsworth 4 p.ct. debenture 79.

On Friday, Alliance and Dublin 64⅛, 66¼, 66½, Gas Light and Coke 83½, 83⅜, 84¼, 84½, 3½ p.ct. maximum 64, 4 p.ct. preference 79½, 3 p.ct. debenture 61⅛, Imperial Continental 155, 155½, 156½ *ex* div., Primitiva 9s. 6d., 4 p.ct. debenture (1911) 65⅜, South Metropolitan 93½, Tottenham "B" 97. Supplementary prices, Wandsworth 3½ p.ct. new 95.

The success of the restoration of the Gold Standard seems to be now assured, and the fears of an increased Bank Rate have receded into the future. Conditions in the short loan market are extremely good, and the position will possibly become easier by the War Loan interest distribution at the end of the month. Balances were available at the end of the week at 3½ p.ct. The Treasury Bill average rate dropped nearly 4s. on the week to £4 9s. 5·9d. p.ct. This rate is still very high, and it is anticipated that ensuing weeks will show an improvement from the Government's point of view.

On the Foreign Exchange Market the dollar-sterling weakened to 4.86 1/16. Both francs and lire were lower in value. The Paris cheque closed at 94.77½, Belgian francs at 97.27½, and Italian lire at 120 3/16. Neutral exchanges generally moved in favour of this country.

The price of gold remained unaltered at 84s. 11½d., and silver on Chinese orders rose ⅛d. to 31⅛d. per oz.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on March 5. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3¼ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME;	Quotations. May 22.	Rise + or Fall − on Week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 5	5	5	Aldershot 5 p.c. max. C. .	78–81	..	..
295,492	,,	,,	4	4	Do. 4 p.c. Pref. .	71–76	..	..
1,551,868	,,	Apl. 2	6½	6½	Alliance & Dublin Ord. .	65–70	−1	64⅛–66⅛
374,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb. . .	63–68	..	66¼–66½
300,000	5	May 7	8	8	Bombay, Ltd.	4⅜–5⅛	..	5⅛
170,000	10	Mar. 5	8½	8½	Bournemouth 5 p.c. . .	12–13	..	..
425,050	10	,,	7	7	Do. B 7 p.c. . .	12⅛–12⅜	..	12⅛–12⅛
150,000	10	,,	6	6	Do. Pref. 6 p.c..	11–12	..	..
50,000	Stk.	Jan. 8	3	3	Do. 3 p.c. Deb..	56–59	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb..	78–81	..	..
992,045	,,	Mar. 5	6 7/16	6⅜	Brentford A Con. . . .	95–100	−2½	95–95½
990,500	,,	,,	6⅜	6⅜	Do. B New . . .	95–100	−2½	95
76,000	,,	,,	5	5	Do. 5 p.c. Pref. . .	95–98	..	..
306,690	,,	Dec. 18	4	4	Do. 4 p.c. Deb. . .	76–81	..	78–79
181,337	,,	,,	6	6	Do. 6 p.c. Rich. Red. Deb.	100–105	..	..
214,740	,,	Mar. 5	11⅛	12½	Brighton & Hove Orig. .	165–170	..	..
244,200	,,	,,	8⅛	9⅛	Do. A Ord. .	122–125	..	..
1,287,500	,,	Feb. 19	5	5	Bristol 5 p.c. max.. . .	96½–97¼	..	..
855,000	,,	Mar. 19	8	7	British Ord.	110–115	..	110—112½
100,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref.. . .	123–128	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. .	72–77	..	..
100,000	10	May 21	6	8	Cape Town, Ltd. . . .	6¼–7¼*	−½	..
100,000	10	Apl. 23	4⅛	4⅛	Do. 4⅛ p.c. Pref.. .	6–7	..	..
150,000	Stk.	Dec. 18	4⅛	4⅛	Do. 4⅛ p.c. Deb..	71–76	..	..
626,860	,,	Feb. 19	6	6	Cardiff Con. Ord. . . .	101–104	..	..
237,860	,,	Jan. 8	7⅛	7⅛	Do. 7⅛ p.c. Red. Deb. .	104–107	..	..
157,150	,,	Feb. 19	5	6⅛	Chester 5 p.c. Ord. . . .	89⅛–94½b	..	..
1,513,280	,,	Mar. 5	6	5/14/8	Commercial 4 p.c. Cap. .	86–89	..	87½–87⅝
560,000	,,	,,	6	5⅜	Do. 3⅜ p.c. Cap. .	80–89	..	..
475,000	,,	Dec. 18	3	3	Do. 3 p.c. Deb. .	57–60	..	..
800,000	,,	14 Jan. 15	—	—	Continental Union, Ltd. .	35–40	..	35⅛–36
200,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref. .	88–92	..	..
660,000	,,	Mar. 5	6⅛	6⅛	Croydon sliding scale . .	98–102	..	..
284,975	,,	,,	5	5	Do. max. div.	81–86	..	82¼–83¼
492,270	,,	Feb. 19	6	9	Derby Con.	110–112c	..	..
55,000	,,	Jan. 8	4	4	Do. Deb.	74–76c	..	..
1,002,180	I	Jan. 22	6	4	European, Ltd.	7–8	..	..
16,460,070	Stk	Feb. 19	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	83–85	..	83½–84⅛
2,600,000	,,	,,	3⅛	3⅛	Do. 3⅛ p.c. max. . .	62–65	..	63⅛–64⅛
4,062,335	,,	,,	4	4	Do. 4 p.c. Pref. . .	78–80	..	78⅛–79⅜
4,761,930	,,	Dec. 18	3	3	Do. 3 p.c. Con. Deb. .	59–62	..	60¼–61⅛
130,000	,,	—	10	10	Do. 10 p.c. Bonds . .	..	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Mar. 19	6¼	6¼	Hastings & St. L. 5 p.c. Conv.	92–97	..	..
258,740	,,	,,	5⅛	5⅛	Do. 3½ p.c. Conv. .	73–78	..	76
70,000	10	May 7	10	10	Hongkong & China, Ltd. .	15⅛–16⅛	..	..
86,600	Stk.	Mar. 5	10	10	Hornsey 7 p.c.	136–141	..	..
1,976,000	,,	May 21	10	59	Imperial Continental Cap..	153–158*	−27	155—183⅛
263,950	,,	Feb. 5	3⅛	3⅛	Do. 3⅛ p.c. Red. Deb.	71–74	..	73—73⅛
235,242	,,	Mar. 19	6⅛	6⅛	Lea Bridge 5 p.c. Ord.. .	96–101	..	..
2,127,340	,,	Feb. 19	5⅛	5⅛	Liverpool 5 p.c. Ord. . .	89–90b	−⅛	..
600,000	,,	Mar. 19	7	7	Do. 7 p.c. Red. Pref.	103⅛–104½b	..	..
165,736	,,	Feb. 19	9	8	Maidstone 5 p.c. Cap. . .	122–132	..	..
63,480	,,	Dec. 18	3	3	Do. 3 p.c. Deb.. .	53–58	−1	..
75,000	5	Dec. 4	7	5	Malta & Mediterranean .	4⅛–4⅜	..	..
5,141,920	Stk.	Nov. 20	4	4	Montevideo, Ltd. . . .	67–70	−1⅛	..
2,061,315	,,	Mar. 5	5	5	Newcastle & Gateshead Con.	77⅛–78d	..	..
300,929	,,	,,	4	4	Do. 4 p.c. Pref..	73–74d	..	..
529,705	,,	Dec. 18	3⅛	3⅛	Do. 3⅛ p.c. Deb.	68⅛–69⅛d	..	..
15,000	,,	Mar. 5	11	12	North Middlesex 10 p.c. .	..	..	..
75,940	,,	,,	7⅞	8⅛	Do. 7 p.c. .	..	..	..
300,000	Stk.	May 7	9	7	Oriental, Ltd.	100–105	..	..
188,120	,,	Jan. 8	7⅞	7⅞	Plym'th & Ston'house 5 p.c.	109–114	..	..
60,000	50	Mar. 5	13	14	Portsea Island B . . .	96–99	..	..
100,000	50	,,	12	13	Do. C	93–98	..	..
2,289,909	1	—	—	—	Primitiva Ord.	9/- –10/-	..	9/- –9/6
511,700	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb. .	79–81	..	80⅛–81
600,000	Stk.	Jan. 22	4	4	Do. 4 p.c. Red. Deb. 1911	64–66	..	64⅛–65⅛
220,335	,,	Dec. 18	4	4	Do. B. Aires 4 p.c. Rd. Db.	65–67	..	..
321,670	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	65–67	..	..
150,000	10	Mar. 19	6	6	San Paulo 6 p.c. Pref. . .	78–83	..	..
125,000	50	Jan. 2	5	5	Do. 5 p.c. Red. Deb. .	43–46	..	..
270,000	Stk.	Mar. 19	5⅛	5⅛	Sheffield A	103–105c	..	..
419,968	,,	,,	5⅛	5⅛	Do. B	103–105c	..	..
1,047,000	,,	,,	5⅛	5⅛	Do. C	103–105c	..	..
90,000	10	Oct. 23	8	6	South African	7–9	..	..
6,609,895	Stk.	Feb. 19	5	6⅛	South Met. Gord.	93–95	..	93⅛–94
1,895,445	,,	Jan. 8	3	3	Do. 3 p.c. Deb. . .	59–62	..	..
734,000	,,	Mar. 5	6⅛	6⅛	Do. 6⅛ p.c. Red. Deb.	102⅛–104⅛	..	103
91,500	,,	Mar. 5	8⅛	8⅛	South Shields Con. . . .	135–136d	..	..
1,187,795	,,	Feb. 19	6⅛	6⅛	South Suburban Ord. 5 p.c.	95–98	−3	95
368,837	,,	Dec. 18	5	5	Do. 5 p.c. Pref. . .	97–100	..	98–98⅛
647,740	,,	May 7	5	5	South'mpt'n Ord. 5 p.c. max.	81–84	..	..
121,275	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	72–77	..	..
250,000	,,	Mar. 5	7	7	Swansea 7 p.c. Red. Pref. .	102–104	..	..
200,000	,,	Dec. 18	6⅛	6⅛	Do. 6⅛ p.c. Red. Deb.. .	103–105	..	..
120,000	,,	Feb. 19	8	8	Tottenham District A 5 p.c.	116–119	..	..
882,275	,,	,,	6⅛	6⅛	Do. B 3⅛ p.c.	95–98	−1	96½–97
181,255	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	77–80	..	..
258,251	,,	Mar. 19	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, & Wycombe 5 p.c. . .	74–76d	−3	..
197,894	,,	Feb. 19	6⅞	6⅞	Do. 5 p.c. Pref. . .	95–100	..	..
88,130	,,	,,	5	5	Do. 5 p.c. Deb. . .	95–100	..	..
91,800	,,	,,	—	6⅞	Do. 5 p.c. Maidenh'd	90–95	..	..
					Wandsworth, Wimbledon, and Epsom—			
80,000	,,	Mar. 5	9⅛	9⅛	Wandsworth A 5 p.c. .	130–135	..	..
855,630	,,	,,	7⅛	7⅛	Do. B 3½ p.c.	110–115	..	..
392,955	,,	,,	6/9/6	6/9/6	Do. C and New	95–100	..	95
352,000	,,	,,	7⅛	7⅛	Wimbledon 5 p.c. . .	105–110	..	..
98,000	,,	,,	7⅛	7⅛	Epsom 5 p.c.. . . .	112–117	..	..
88,416	,,	Dec. 18	3	3	3 p.c. Deb.	57–60	..	..

Quotations at :—a_5—Bristol. b_5—Liverpool. c_5—Nottingham. d_5—Newcastle, e_5—Sheffield. * Ex; div.

GAS JOURNAL

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INSTITUTION MEETING

A complete account of the week's proceedings will appear in the single issue of the "JOURNAL" published on June 17.

EDITORIAL NOTES.

More Interest for the Institution Meeting.

s the days pass, the arrangements for the annual meeting f the Institution of Gas Engineers gather more and more nterest. The prospect is that numerically the meeting ill be equal to the best of records. The acceptances for nctions and visits show this. For example, those who ave signified their intention of visiting either Fulham, the outh Metropolitan Chemical, Physical, and Burner aboratories, or the National Physical Laboratory on hursday afternoon total something like 450; and the resident (Mr. J. Ferguson Bell, M.Inst.C.E.) and his hairman and Directors will have the felicity of welcoming Derby on the Friday approximately 420 visitors. At the ening meeting, the expected attendance is between 600 nd 700. A number of distinguished visitors as well as embers from overseas will also be present; and they ill have a warm reception from the members who carry n the work of the industry at home. On behalf of the sitors, there will be response to the welcome of the Presint by the Rt. Hon. J. H. Thomas, M.P., the Rt. Hon. r Alfred Mond, President of the Society of British Gas dustries, and Mr. W. Woolley (Chairman of the Derby as Light and Coke Company); and on behalf of the overas visitors, the Hon. George Swinburne, of Melbourne, ll reply. Among other matters of outstanding personal terest will be the presentation of the Birmingham Gold edal to Dr. Charles Carpenter, C.B.E., M.Inst.C.E.; d the members will take advantage of this opportunity give expression to their unanimous views as to the aluable work over long years that Dr. Carpenter has ccomplished for the gas industry. The winners of plomas in the recent Institution examinations in Gas ngineering will be personally presented with their certifites at the meeting; and they will have the further ward of receiving the massed congratulations of the mbers. The names of the successful diploma candites are given in later columns. The technical proamme for the meeting, with other features, have been eviously dealt with; and elsewhere to-day we publish Council's annual report, which shows a year of great tivity, with resulting additions to knowledge beneficial our industry.

The Campaign.

E gas industry is heading a campaign—not only in its n interests but in those of the nation, and, we verily lieve, of the electricity supply industry. It was opened Mr. D. Milne Watson, in the Presidential Address to Society of British Gas Industries which we reported d commented upon last week; and it was continued by n, with further effective point, in the address which delivered at the annual meeting of the National Gas uncil yesterday week. We cannot have too much icism, nor too much publicity, in respect of this urgent l momentous matter of the intentions of the Government in regard to electricity. Right at the initial stages of this campaign, however, it is necessary to proclaim frequently and widely that the gas industry has no fear of, and, of course, it has no valid objection to, the development of the electricity industry by its own exertions, merit, and resources; but the position has been transformed by the prospect of legislative preference and State aid, and that on altogether chimerical grounds. The situation is such that any scheme which the Government may propose, if State aid or legislative preference is involved, must be resisted to the fullest extent of the power of the gas industry; and more particularly as not a particle of national advantage has been or can be shown. On the contrary, in view of the absurd emanations of certain political imaginations, the prospect is a distinct national disadvantage, which in its incidence will seriously involve the gas industry as taxpayers and competitors of the electricity industry. Competition on level terms is an excellent thing; if the Government throw their weight on one side to the detriment of the other, they will be doing something which is both unjust and unwise. There is a possibility upon which there has not been any direct comment: It is, if experience should show that harm instead of benefit has been imposed by statutory process and State aid upon the electricity industry, its patrons, and the country, will there then be further relieving subsidies from the Government? That is a possibility which must not be overlooked.

The objections of the gas industry can be based on five grounds: (1) That, in view of the statements of ministerial spokesmen, the Government are wrong in their premises; and that the expected good effects upon industry and unemployment cannot result from their proposals. (2) That assuming the Government are right in their premises, then the granting of statutory preference and State aid for one competitor as against another is altogether wrong. (3) That if the Government are in error, and the results anticipated by them do not accrue (to the financial detriment of the electricity industry), will increased State aid be allowed by way of relief? (4) That the development of electricity supply in the directions indicated will be a national disadvantage from the point of view of the conservation of our coal resources. (5) That the Government have not considered the whole problem of the national provision of power and heat from the standpoints of the conservation of coal and the national co-ordination of the use of fuel. There are plenty of substantial reasons why the administrators of gas undertakings should strongly support their leaders on the National Gas Council by using every available opportunity, and all influence they possess, to make public the mischievous trend of things through the gravely mistaken policy of the Government. It is true that even now we do not know what is in the Weir report; but the speeches that have been made by responsible members of the Government disclose an intention upon which it is sufficient to act, and that promptly. We are glad to note that already there are indications of somewhat less confidence as to the pro-

priety and soundness of what has been in the minds of the politicians; and there are members of the electrical industry who have been speaking and writing in no uncertain way much along the lines taken by Mr. Milne Watson in his addresses on the subject.

The deliverance by the President at the meeting of the National Gas Council may be taken as supplementary to the one at the meeting of the Society of British Gas Industries. In the latter, as we showed last week, he advanced ample evidence to cause those who are pushing this question of State aid for developing the electricity system of this country to pause (if prudently inclined) and reconsider their position and attitude. But when one takes the two addresses in conjunction, the evidence becomes absolutely overwhelming against the proposals of the Government. If these showed any intrinsic national benefit, there could not be the same degree of objection to them, but, as a matter of fact, they do not. Furthermore, they ignore entirely the services of the gas industry in a country where coal is the prime asset, and in the use of which this industry has been more successful than any other in meeting the needs of the community. In doing this, it has also done more to conserve our valuable coal supplies, and put them to better use, than any other process existing or in prospect. There must therefore be insistence upon full recognition being given to the point so frequently made in our columns, that coal, power, and heat are questions and present problems which are inextricably bound together, and should be considered in their entirety with the whole range of provision and utilization. In this connection, it may be asked, is the cost of obtaining electric power excessive? The answer is "No." Is the cost of obtaining heat by electricity excessive? The answer is "Yes; and it is a most uneconomical proceeding." Yet the Government appear to be unaware of the fact, and so are the public, excepting those who have tried electric heating, and have discarded it save for very occasional and never continuous use. For industrial power purposes, the President points out, electricity here is as cheap as it is in Chicago, and twice as cheap as in Switzerland; and in any case it only represents something like 1½ p.ct. of the total manufacturing costs—indeed, in a representative engineering works of which he knows, power only represents 0·8 p.ct. of the total manufacturing costs.

Resentment is being shown in the electricity industry over the suggestions made by political leaders that the costs of electrical power are too high. We can understand the feeling, in view of the remarkable gap there is between electric power and lighting charges for reasons of expediency. The "Electrical Times" has denied the Prime Minister's statement that the country is "paying too much for its light and power." And as to the effect of power costs on industry, a correspondent of "The Times," who signs himself "B," and is manifestly an electrical man, asserts that while in some industries "the cost of electrical energy is the paramount item, in others it is an appreciable item, but in many industries, if the electricity were given away, it would not make one-half of 1 p.ct. difference in the selling price of the finished product." The same writer asks why the electricity industry has left it to the gas industry to proclaim these elementary truths from the housetops; and he speaks of the danger of the country being stampeded into a vast expenditure of public money for which no case has yet been made out. Again we have Mr. C. Nelson Hefford, the Engineer of the Leeds Corporation Electricity Department, writing to the "Yorkshire Post," urging that an attempt should be made to stimulate public interest in what is developing at Westminster in respect of electricity. He criticizes strongly the false hypotheses upon which the proposals are based. Among several other pertinent points he states that in our large generating stations, whether publicly or privately owned, there is very little margin to-day for any possible saving; and he sees retarding consequences rather than aids to progress in the artificial development of large stations beyond the natural economic demand. Like many other competent men he cannot see whence the wonderful economies are to come. In the President's address at the National Gas Council meeting, there is further evidence as to men in high places in the electricity supply industry viewing the proposals of the Government with anything but enthusiasm—rather with scepticism and dismay.

The points in the address as to the costs of current, consumption per head in comparison with other countries, unemployment, &c., accentuate what was said in the prior address, and demonstrate beyond any contradiction that the Government are following something that is very illusory. So much so that electricians are asking why these matters are not being exposed by the electricity industry, instead of the gas industry. It seems to us (as previously remarked) that the gas industry has taken up a current piece of work—inaugurated so well by Mr. Milne Watson—which is not only in its own protection, but in that of the electricity industry, and the nation at large. But for some inexplicable reason the leaders of the electricity industry appear to be accepting the position lying down, probably regarding the hoped-for State aid as being some compensation for all else not so pleasant that will follow when people awaken to the fact that—presuming the scheme matures—the Government have been misled, and the golden egg turns out to be something wholly fictitious. We hope that all who are interested in these two addresses will read and make use of them as widely as possible, so that the misconception that exists and the truth of the matter may be broadcasted everywhere. This is no time for sitting idle and allowing things to take care of themselves.

Getting and Keeping the Business.

One of the main objects of the District Conferences of the "B.C.G.A." is local publicity. They serve that purpose magnificently in a large radius from the place of meeting. Gas men find they also yield a splendid crop of suggestion and encouragement—no matter whether the individual is engaged in a large or a small concern. This applies to the Minehead and Harrogate conferences, just as it did to those which preceded them. The Minehead Conference was reported a fortnight ago, the Harrogate one in the current issue. As the reports are read, and what they reveal in actual accomplishment is noted—good accomplishment in totally different walks in our industry—we cannot refrain from a little amusement as there comes to mind those of our competitors who examine us through densely coloured glasses or through the wrong end of a telescope, and those political dispensers of favours who appear to be seriously ignorant of the existence and activities of the gas industry, but are of opinion that the electricity industry is in much need of their benefactions. Just consider the mammoth expansion figures given at Minehead by the President of the "B.C.G.A." (Mr. J. H. Elliott, Chairman of the Plymouth and Stonehouse Gas Company), which showed that in statutory areas the output of gas in 1924 increased by 12,272,000,000 c.ft., the number of consumers by 95,897, and cookers and grillers by 316,900. To those increases little Minehead made its contribution as did popular Harrogate, and all the big, medium, and small undertakings of the United Kingdom, despite the frantic efforts of electricity to take from gas part of the domestic load; and, through local influence and not merit, the lighting of streets and public institutions.

Those of our readers who have perused the paper of Mr. Edwin P. Vince, the Manager and Secretary of the Minehead Company, must have been struck and pleased by the high standard of trading policy which that Company prove can be as advantageously adopted by the smaller undertakings as by the larger ones. The Company, with admirable vigour, do their part in the common cause, and apply all things that are beneficial to the business, precisely in the same way as the larger concerns which are progressively directed, with the result that since 1897 they have multiplied their gas sales six times. In that year the consumption of gas was 8 million c.ft.; last year it was 48 millions. Those figures induce one to reflect upon the power, even within limited circumstances, of wise administration. Mr. Vince's paper may be taken as a rebuke to those managements of small concerns who in respect of policy hang back in the shadows of the past. From the statements in the paper, we see nothing more than that is part of the administrative policy of the live of our progressives. And this small Company finds

pays. When we see that 500 houses have been erected in Minehead since the Armistice, and that all of them, except two, have been piped for gas, and the pipes so arranged that gas fires can be fixed in any room, there is as lively satisfaction over the evidence of a go-ahead policy, as there is in learning from Mr. Westlake that, in 95 p.ct. of the houses erected in the dear old city of Exeter in the past four or five years, the extravagant piece of kitchen equipment, the coal range, has not been adopted, but the more efficient, cleanly, non-smoke-producing gas cooker has been installed instead. It must be that our builders and architects are at length being converted to the idea that building economy and modern house efficiency through gas utilization are congenial companions.

To the maintenance of the marvellous purity of the air at Harrogate, we find, from the paper by Mr. Frank H. Robinson, at the conference in the town last Thursday, that gas and coke make excellent contribution. We dare not attempt to imagine what the air of the town would be like if the Company's 11,000 consumers were to return to coal for cooking and heating. We often talk of the good part gas has taken in minimizing the pollution of the atmosphere; but we know there are still nearly 40 million tons of coal used for domestic purposes in this country. The products of combustion from that quantity of coal are a terrible air-polluting affliction; but if it be possible just try to visualize what the conditions would be if the 5½ million gas cookers and grillers did not exist in the British Isles, as well as gas-fires which have never been enumerated. The paper shows the practical unanimity of hotel and boarding-house proprietors in Harrogate in utilizing gas for cooking, coke for central heating, steam-raising, &c., and prepayment metered gas-fires for bedrooms. In the kitchens of establishments where catering on the large scale is carried on, flexibility, cleanliness, reliability, and promptitude are essentials in the appliances used; and gas-heated appliances have all these virtues. As to gas-fires with slot meters attached, the paper shows that the hotel and boarding-house proprietors can get 10 p.ct. on the capital expenditure. In the Harrogate boarding schools and colleges, the equipment is much the same as in the hotels. System is applied in maintaining the good reputation of gas in these large establishments. Before the commencement of the holiday season, the appliances in the hotels and boarding houses are examined, repaired, and adjusted by the Company. Before a term begins at the schools and colleges, the gas apparatus in them is consistently overhauled. At all times, too, fitters are available to keep the appliances working at full efficiency. No charge is made for advice and regulating the appliances; only for repairs, cleaning, and overhauling. And Mr. Robinson finds there is plenty of room for developing service, to the advantage of both the Company and the proprietors of the establishments. The paper contains much suggestive material for those engaged in gas supply in our seaside and inland resorts.

Plant Design and Control.

A MATTER which has large importance in the economy and efficiency of gas plant was introduced in an address by Dr. Geoffrey Weyman to the recent auxiliary meeting of the North of England Gas Managers' Association. This is an age of plant standardization, which is all very well up to a point, but it has the drawback that it does not take into the reckoning variations in local conditions. A standardized plant may, in a situation with local conditions wholly appropriate to it, work splendidly under proper control; but change the conditions, and the same plant may not give nearly such a good account of itself. The address is one which will be considered by both manufacturers and users; and the former will no doubt have a very good case to put up against part of Dr. Weyman's submissions. For example, standardization—instead of the manufacturer having to work to new designs each time—may mean a material saving of capital charges, and also money economy in reconstruction and repairs. On the other hand, the working economies and efficiencies of a specially designed plant to suit local conditions may more than wipe out any additional capital, renewal, or repair charges. It is a controversial point, and one which it is apparent can only be settled by a consideration of the circumstances of each case. We are not going so far as to support Dr. Weyman in his assertion that, when once a plant has been evolved and placed on the market, the manufacturers often lose touch with the small details which contribute so much to successful results. They may do so sometimes; but looking at the history of plant evolution, we have frequently been surprised at the rapid response made by the manufacturers to requirement. Moreover, we have also been aware that the diversity of conditions under which they have to construct plant, and the varied knowledge they gain through contact with different engineers and the recounting of experiences, are frequently the means of bringing about the introduction of improvement. Therefore, we should prefer the "often" in Dr. Weyman's modest indictment to be modified.

Again, it is not always true that the only party really in a position to appreciate the problem and to formulate an economical plant is the user himself. One's point of view is largely guided by experience; and Dr. Weyman views things from the standpoint of one whose professional experience has been in a works staffed by high qualifications. There are engineers and engineers. There are engineers who are assisted by men who know every detail of a works' requirements. The wise chief takes them into his counsel. There are others whose opportunities are not of the same order, and who are not so fortunately placed. Many plants are new to some engineers; and it is an excellent thing for them that the manufacturers can come to their assistance with experience. Dr. Weyman's assertion as to "the only party really in a position to appreciate the problem and to formulate an economical plant is the user himself," cannot apply to such engineers; the best thing for them to do is to recognize that there is another party with knowledge, co-operation in which is valuable. While saying this, there is agreement with the point made that in recent years the education and the training of technical staffs in the gas and other industries has been greatly improved; but, again, it depends on circumstances whether "there is no adequate reason why the design and arrangement of plant should not be systematically considered, and the plant makers be given the necessary plans and specifications which would enable them to put forward plant which is suitable in design and convenient in arrangement for each particular set of circumstances." That requires qualification. "Local conditions" apply to men and knowledge, as well as to situation and raw materials.

But the little difference we have with our Newcastle friend's opinions really only extends to their modification in respect of dissimilar conditions. They are justified in some circumstances, but are not universally applicable. However, there is much else in the address with which there can be absolute concurrence. It may be agreed without reservation that designing a plant best to suit local conditions requires imagination. Its capacity or productive quantity is not the only consideration. One needs to design with a mental picture before him of the conditions under which the plant will be working. Overall efficiency and economy are desiderata. Men cannot work to the highest efficiency unless the conditions for doing so are favourable. There cannot be the satisfactory control that is necessary unless provision is made of accessible positions for the points at which the controlling operations are to be performed—operations involving testing or regulation. Inaccessibility involves labour and time, and engenders a proneness to shirk the work. In designing plant this can be avoided by a little imagination, visualization, or forethought. This has increased importance with the more modern types of plant than with those of earlier days. They have become more intricate, and so has their operation. These facts and the modern conditions of supply make ease of control and accessibility to the point of control real essentials. No one will dispute Dr. Weyman's declaration that if plant is to work with maximum economy, it is necessary to know both when it reaches that desirable level, and the conditions under which this state of affairs can be maintained. Control being imperative to success, it is ridiculous not to consider the provision of the necessary facilities for it at the time the plant is designed, rather than apply them as an afterthought. They are the assurances of

making the money invested in the plant realize the greatest profit. But here again Dr. Weyman says: "It has always been a wonder to me that makers of plant should allow units which they are anxious should be an economic success to be installed without any means whatever of ensuring by proper control that they are so." With that there is agreement. But is it not also a matter for surprise that, if the "only party really in a position to appreciate the problem, and formulate an economical plant is the user," he should allow plants to be erected without facilities for proper control? The user must also be anxious that the type of plant he has recommended shall be an economic success.

There are many other points in the address which will arrest the interest of those whose work is to design plants, or to see that the design is such as to secure and maintain maximum efficiency. The treatment of coal with the view to obtain uniformity of the raw material is one. Dr. Weyman says that there is no doubt a considerable proportion of capital ought to be devoted to this object, as true economy cannot be realized in the retort-house if the coal used is varying from retort to retort and from hour to hour. That must be decided on the basis of the relation of costs to effects. In this connection he also urges, in view of recent investigations, the consideration of the inclusion of blending plant for properly mixing charges with coke breeze or non-caking material. We cannot help thinking that there is much to be done in this way, with the dual object of improving heat transmission through retort charges and enhancing the physical characteristics of coke.

Coke Competition.

June 30 is the last day for the delivery of papers to the Editor of the "Journal." Particulars and conditions were given in the "Journal." for Feb. 18. The prizes total to £1000.

National Gas Council.

In an editorial article, reference is made to the address of the President (Mr. D. Milne Watson) at the meeting of the National Gas Council; but on this occasion the comment is confined to the subject which is raising concern in the minds of a good many men in the country—that is, the intention of the Government in regard to what they apparently believe will secure the development of electricity supply and, through it, the interests of the country. In considering this supremely important matter, sight must not be lost of the vast amount of work which has engaged the attention of the Council during the past year, as revealed by the annual report published last week, and the introductory remarks of the President at the meeting. But great and important as has been that work, it is obvious that the future has in store many more momentous questions which the whole gas industry will have to face in combination through the Council; and there must be no stinting of any necessary expenditure. Otherwise, we shall live to rue the short-sightedness. On March 31 last, there were 841 undertakings subscribing to the funds of the Council, representing 88 p.ct. of the total make of gas in the United Kingdom. Where are the undertakings comprised in the 12 p.ct.? Are they not enjoying the fruits of the work done voluntarily, and the expenses attaching to which are paid by the 841 undertakings? Surveying modern and prospective conditions, there is certainty that the fullest unity is essential. The very position and progress of the industry attract people—some to see what they can get out of it, others moved by envious motives, others again who seek to put before it new barriers and upon it new obligations. There is no question the National Gas Council will have to be maintained in existence and in the highest state of efficiency and power—always. To part with it (no one fortunately dreams of doing so) would be to cut out from the industry a vital part.

"Field's Analysis."

On a later page will be found a review of the 1924 edition of "Field's Analysis," which has just been published. Attention is drawn to some of the notable figures contained in the work; particularly interesting being the reference to the working of the Gas Light and Coke Company for the past year. The "Analysis," under the guiding hand of its compiler, Mr. H. E. Ibbs, Chief Accountant of the Gas Light and Coke Company, will be found to maintain fully the high standard of efficiency which is always associated with this publication.

Mains of Insufficient Capacity.

At length, a clause has been agreed between the railway companies and the National Gas Council to supersede the one which previously had existence with regard to relief to gas undertakings from the obligation to supply gas where mains are of insufficient capacity. In future, gas undertakings should be able to obtain the insertion of this clause in their Private Bills or Special Orders. The negotiations over the clause have given much trouble and absorbed much time; but the issue appears to give full protection to gas undertakings who may require it, while satisfying the railway companies, which has not been an easy matter. The clause appears *in extenso* in our "Parliamentary Intelligence" under the heading of "Mansfield Corporation Bill."

All-Electric Houses.

We should like the attention of the Rochdale Town Council called to the article which appeared in the "Journal" for May 13 (p. 444) under the heading "Municipal Prohibition of Gas." They will see in it that Parliament does not approve of municipal authorities removing from tenants of houses their right to use whichever forms of lighting, heating, and cooking they prefer. It appears that the Gas and Electricity Committee of the Rochdale Council have decided to adopt a new policy in Corporation houses. According to the "Rochdale Observer," they have hitherto provided a dual service of gas and electricity. Now in sixty-six new dwellings on what is known as the Kilworth Street site, they have decided that electric fittings only shall be installed. The houses will have coal-heated ovens; but the choice is to be between these and electric stoves. We hope the Council will have a greater consideration for domestic economy and the liberties of the tenants than the Committee have shown by their autocratic resolution. Also that they will consider the bearing of the Newport decision to which reference is made in the opening lines of this paragraph.

Domestic Coal Prices.

Through untoward circumstances, the price of gas has ascended; but fortunately this is the period of lightest consumption. The London coal merchants are now making strong efforts to secure the custom of householders. In Central London the "lowest summer coal prices" came into operation last Saturday. From the quotations we see that Derby brights show a reduction of 3s. 6d. per ton on 1924, and 1s. on 1923, whereas kitchen nuts are no less than 6s. cheaper than in 1924, and 5s. cheaper than in 1923. "Best coal" is now quoted at 50s., as against 56s.; best silkstone, 44s. 6d., against 48s.; Derby brights, 45s., against 48s. 6d.; and so on until we come to kitchen nuts at 30s., against 42s.; and stove coal 32s., against 38s. 6d.

How to Save Money.

At their conference at Brighton last week, the Royal Institute of Public Health had the question of the uneconomy of coal smoke brought before them in a paper by Dr. Charles S. Thomson, the Medical Officer of Health for Deptford. He asserts that of the 100 million tons of coal used in this country for industrial purposes, 43 millions are wasted—a record which he is certain must bring a smile to the faces of the very efficient Germans. If manufacturers would only take steps to provide heat without wasting so much by the crude use of coal, they would not need to tremble over their contributions under the new insurance scheme. That is the view of Dr. Thomson.

Electrical Humour.—During the recent heavy floods at Batley the following letter was received at the Gas Office from an electrical engineer: "Dear Sir,—Will you kindly let some one attend to the gas supply at the above address? It seems to be adopting an electrical tendency—being of an alternating nature, with a periodicity of about 1 per sec."

DIPLOMA WINNERS.

In the Institution Gas Engineering Examination.

We have received from the Organizing Secretary of the Education Scheme of the Institution of Gas Engineers (Mr. Walter Hole) a list of the successful candidates at the recent examination for the Institution Diploma in Gas Engineering. The certificates will be presented by the President (Mr. J. Ferguson Bell, M.Inst.C.E.) at the first session of the annual meeting.

First Class.

Name.	Address.	Subject of Thesis.
RATER, THOMAS HAROLD	London . .	Coal Gas Condensation.

Second Class.

MITH, SYDNEY	Birkenhead .	The Manufacture of Sulphate of Ammonia.
LAKE, THOMAS VINCENT	Cardiff . . .	The Volatile Products of Coal with Continuous Vertical Retorts.
IELVIN, DUNCAN DEWAR	Glasgow . .	The St. Mungo Washer-Scrubber.
YSON, THOMAS . . .	Longwood . .	The Construction and Working of the Dempster-Toogood System of Vertical Retorts.
ATEMAN, CHARLES . .	Cardiff . . .	The Neutralization of Sulphate of Ammonia.

There were no candidates for the Diploma in Gas Supply his year.

The results in the Ordinary and Higher Grades will be published in due course not only of the Engineering and Supply Examinations, but of those in the ancillary subjects.

PERSONAL.

Mr. A. H. Besche, who for many years was Sales Director of Messrs. Kerr Stewart & Co., Ltd., of London and Stoke-on-Trent, has been appointed General Sales Manager of Messrs. & F. Howard, Ltd., of Bedford.

Mr. S. Barker Johnson, the Engineer and Manager of the Colombo (Ceylon) Gas and Water Company, Ltd., has arrived in England on furlough. He travelled from Ceylon on the "Ormuz," and reached London on May 29. The London Offices of the Company are at No. 148, Gresham House, Old Broad Street, E.C.

The Colne (Lancs.) Town Council have adopted a recommendation of the Gas Committee that an honorarium of £100 be granted to Mr. H. Thorpe, the Gas Engineer, in respect of special professional services rendered by him in connection with the installation of new plant and the re-modelling of the gas-works. The Chairman of the Gas Committee (Alderman Keighley), replying to an amendment, said Mr. Thorpe had been doing a lot of special work during the last five years. He had got them out of a difficulty, and by adopting his advice the Council had saved between £30,000 and £40,000. Only six voted for the amendment.

OBITUARY.

We are sorry to learn of the death at Bristol, on the 21st ult., of Mr. Robert A. Browning. He underwent an operation early last month, which was satisfactory; but unhappily complications subsequently set in. Mr. Browning resigned in 1915 from the position of Engineer and Manager at the Neath Gas-Works, after having been in the service of the Corporation for 44 years, and was appointed Consulting Engineer for a period of three years. He will be greatly missed from the meetings of the Wales and Monmouthshire District Institution of Gas Engineers and Managers, whose second President he was. The Institution was formed in the autumn of 1905; and Mr. Browning followed the late Alderman Thomas Canning, of Newport, in the chair in 1906—the Institution holding a meeting at Neath during his year of office.

Industrial Gas Salesmen's Circle.

The next meeting of the Circle will be held at the Council House, Birmingham, on Friday, June 19. Members will assemble at ten o'clock. During the morning inspection will be made of the industrial gas demonstration rooms and research laboratories of the Birmingham Gas Department, and visits will be paid to the Windsor Street heat treatment shops, and to the works of the Moss Gear Company, Ltd. At one o'clock luncheon will be held in the Imperial Hotel. During the afternoon brief statements, accompanied by drawings or diagrams, on the following subjects will be presented for discussion: "Some Uses of Gas in Printing Works;" "The Application of Gas to Ship Repairing;" "Large Pipe Bending;" and "Gas and Other Fuels for Power Purposes."

ELECTRICITY SUPPLY MEMORANDA

We are not sure whether the "Electrical Review" intends to be humorous or whether it is a little off the path of truth, when noticing a new scheme for enlarging the finances of the Electrical Development Association. If what it says is true, then the inference is that a large part of the administrators of the electricity supply industry are very foolish and apathetic. It states that men in the various branches of the industry are so imbued with the "electrical idea" that they cannot conceive that the backwardness of the people is anything more than sheer apathy. In the same vein, it proceeds: "They think that, if electricity cannot sell itself on its merits alone, there is nothing more to be done. Accordingly, they go on advertising their individual products merely hoping to attract the attention of those who are already converted to electrical methods, while suppliers of electricity wait for the would-be consumer to call at the office for a list of charges." It is admitted that "there are many honourable exceptions, but they must be exceptions, or Great Britain would be using as much electricity per head as (say) the United States." Is it true that that is the unbusinesslike way electricity trading is carried on? We cannot believe that advertisers of electrical wares merely hope to attract the attention of those who are already converted to electrical methods; their idea in advertising is to attract those who are not already converted, and to keep prominently before purchasers the virtues of their own particular productions. Nor are we inclined to think that electricity suppliers sit in their office armchairs waiting for the would-be consumer to turn up, and ask for a list of the charges. If that is a correct representation of the position, then it is time that the laggard administrators were sent about their business, and enterprising business men appointed in their stead. It also suggests another thing, that the Electrical Development Association have not succeeded in rousing these inert maladministrators to see the errors of their sleepy ways, or have not by their work impressed upon a large proportion of managements the indispensability of the organization, and the effectiveness of its work. Instead of asking for money to educate the public, they should first request a goodly fund for the purpose of educating managements to better business methods, and then the future of the Association would be assured and fully provided for. Of course, it is a far cry for this country to realize a consumption of electricity per head equal to that of the United States. Conditions here and there are not wholly similar; and there are sufficient reasons for the difference which now exists.

Sleepy Administrators.

Then our dear friend the "Review" indulges in a little illogical musing. First of all it says that electricity will not sell itself any more than any other commodities which are not positively essential—and this despite those electrical men who rave about the super-merits of the electrical way of doing things, which is not endorsed by the major preference of the public being for gas, with its greater value for money expended. It asserts with truth that "it is futile to say that electricity is essential to the individual." But this is followed by the vain boasting which is inseparable from the electrical mind, and which has done some amount of good among the people by causing them to look with suspicion upon those who claim everything good for their commodity and acknowledge no defects, which have become as well known to the public as the meretricious prating regarding merit. Says the "Review," "that electricity will ultimately supersede every other form of energy, we are convinced; and we therefore conceive it to be the duty of all who desire the advancement of the race to hasten that consummation." That is wonderful. The mere statement of a personal conviction is not proof that the predicted will happen. The grounds of the conviction are more important, and knowledge of them would be more interesting than the mere unsupported conviction of the "Electrical Review." When the great gas industry is put to death—a prospect which we contemplate with marvellous equanimity—by the appropriation by electricity of the whole of its business, "electricity will," remarks our sagacious contemporary, "then be really essential, for its competitors will have fallen out of use." That is perfectly obvious. If there is only one means of providing light, heat, and power, then that means would be "essential." Perhaps our contemporary can give us some intimation as to the distance of time covered by the term "ultimately," because we see no present or prospective signs of gas falling out of use. As a matter of fact, its position is being strengthened daily. It is neither good logic nor is it practical to talk as the "Review" does in this connection. If gas as a competitor is to be superseded, then as a preliminary electricity has to realize treble or quadruple its present efficiency in the utilization of coal. In this relation, we should like our contemporary to tell us what is to happen to the carbonization of coal, which is "fundamental in the part it plays in modern

On Being Essential.

civilization" and in the work of the world; the products being highly essential to our industries. Being so, gas must be produced; and as gas is produced with a greater efficiency than electricity, more potential heat energy is, for a given sum, placed at the disposal of the individual through it than through electricity. If the latter is only to become "really essential" by the death of its competitors, then it will have to wait a very long time.

More Propaganda Revenue Wanted.

If what our contemporary says is the sort of thing that is considered to be necessary to construct a case for a larger revenue for the Electrical Development Association, we are afraid it will not assist much among intelligent men. However, we get to a more serious plea for support of the work of the Association. What is wanted, it is stated, is education of the public. "The public," it is said, "is not apathetic when it is shown where its best interests lie; and it is the work of the electricity industry to do this." What has the Development Association been doing during the years of existence if it has not been educating the public? If the organization has been performing its functions efficiently, it has been "educating" the public from the electrical point of view; but apparently the public are not convinced that their "best interests lie" in the adoption of electricity for cooking and room and water heating. We admire the sagacity of the public. Our contemporary, however, thinks that "within the rigid limits imposed by inadequate funds, the E.D.A. has accomplished a great deal; but none of its effective slogans is yet a household word." We are not astonished. Now the Association assert that the industry is not giving it enough money to make the work as effective as it should be. The result is spasmodic efforts instead of a sustained campaign. Therefore a brochure has been prepared which has been addressed to the members of committees, boards, and managers of all electricity supply undertakings in Great Britain. In this the activities of the Association are described; and care is taken to show how small a proportion of the revenue of electricity supply undertakings is devoted to the important work of educational propaganda. The request is made to the responsible persons addressed to arrange that 0·1 p.ct. of the revenue of their undertakings is contributed to the funds of the Association. It is stated that the manufacturers and other associations have agreed to increase their subscriptions if the suppliers will respond to the appeal. It is confidently anticipated that the proposals for future activities will result in assuring the Association a revenue sufficient for their growing internal work, and in addition for direct educational efforts, to the value of from £20,000 to £25,000 per annum.

The Enlarged Campaign.

The main objectives of the enlarged campaign which the Association hope to be able to carry out if entrusted with greater disbursement power are described as follows: To build up national and industrial goodwill; to remove unwarranted bias and criticism; to establish and maintain public confidence; to encourage local inquiries for electrical information and advice; to create demand; to obtain increased revenue from the fixed charges of electricity supply undertakings; to reduce the cost of supply to consumers; and to increase the revenue and profits of suppliers. Regarding this programme our contemporary remarks: "Nothing is said of the direct benefits to manufacturers and contractors; but these are, of course, sufficiently obvious. Such a programme should loosen the purse strings of the most sceptical or conservative committee or board."

A Queer Reply.

Viâ the Editors of the "Electrical Review" (whom we thank for their courtesy), we have had forwarded a letter from Mr. E. G. Ross, which purports to be a reply to our criticism (see "Memoranda" for May 20) of an article of his which appeared in our contemporary. Of all the disjointed, ineffective effusions that has ever reached us from any source, this one, we truly believe, easily takes precedence. There is not a point in it which in any way alters our criticism and expressions of opinion based on experience and testing (scientific and practical) which were published upon his laboured and fruitless work—fruitless because the analyzed heat losses on gas and electric hotplates (the data being derived in his case by methods which were confessedly crude, and therefore unreliable) are easily ascertained in the total by doing the same amount of water boiling, noting the input of thermal energy while the work is being done, and discontinuing when the water reaches boiling-point. There is for making comparison more definiteness and reliability in this procedure than in that of Mr. Ross. Several of the comments of our correspondent are really too absurd to deal with seriously. But reference may be made to three or four points. Mr. Ross makes a distinct departure from the truth when he says: "I am indebted for the suggestion that *it is essential* to keep on full heat for four hours to keep the pot contents boiling." Nowhere in our criticism did such a stupid idea as that appear; nowhere did we say that such a thing was "essential." As to the loss of heat when boiling, he says that a "minimum" of 30 p.ct. is not contradicted by us. We would ask Mr. Ross to read again what he said in his article: "From data variously collected, it would seem that when boiling for approximately four hours in a pot about 5½ in. diameter, anything from a minimum of 30 p.ct. to a maximum of 60 p.ct. of the available gas heat is lost, due to these essential conditions of burning." This is what we said: "The minimum of 30 p.ct. is nearer *normal* practice to-day than the maximum of 60 p.ct. As a matter of fact, the modern boiling-ring on the hotplate of a gas cooker is quite capable of developing 70 p.ct. efficiency." Cannot he see in this that we did not agree with his minimum *per se*, but accepted it as being about "normal." There is a wide difference between a minimum of 30 and a maximum of 60 p.ct. It is observed that Mr. Ross carefully abstains from replying to our inquiry as to whether he can suggest to us any electric boiling-plate which will at any part of its life and continuously give an efficiency of 70 p.ct.; and he ignores the question: Is it not the fact that most electric hotplates will only develop (when new) 40 to 45 p.ct. efficiency, and that a diminishing quantity with use?

Ribs and Costs.

As to the old-fashioned ribs which assist to dissipate heat by conduction from the hotplate of gas-cookers, we mentioned that the gas industry found this out long ago. Mr. Ross asks then why were the ribs not cleared out "long ago;" and further he wishes to know just what proportion of all the cookers installed in this country do the "modern cookers" made within the last few years represent. On Mr. Ross's notepaper, we see his description is "Electrical and Mechanical Engineer." As such we should have imagined he would know that it is no light task to take out a few million gas-cookers and reconstruct the hotplates. We have to be sensible in dealing with such matters. What is being done by many gas undertakings is, as cookers come in for renovation and repair, to remove the old hotplates and incorporate one of the high efficiency types. This, an engineer will agree, is a rational proceeding. Goodness knows how many "modern" cookers have been installed in this country the last few years; but the makers have been busy turning them out, and not for the mere fun of the thing. They have also been making the new types of efficiency hotplates for replacement purposes; and a good business it is. Mr. Ross gives his expenses for gas cooking (including boiler) over a period of eight months as £5 16s.; and electricity (light and iron), flat rate, as £3 8s.—together £9 4s. We do not know what the respective charges were, or the amount of work done. But in a corresponding electric-cooker period, the total costs on the two-part tariff (including 13s. 4d. hire charge, and 7s. 10d. for gas for boiler) was £7 7s. 11d. No information is given as to the fixed charge and the charge per unit, nor as to the work done. All that is said is "for the same conditions of living." As they stand, the figures do not prove anything." In connection with them, we will repeat the last five lines of our previous comment: "After all this, will Mr. Ross accept a challenge to do an equal amount of work with an electric cooker (oven and hotplate) as with a gas cooker, at a cost for 'fuel' of ¾d. per unit for electricity and 10d. per therm for gas, or 3420 B.Th.U. as against 7500 B.Th.U. for ¾d. in each case?" He has omitted to reply to this. We will guarantee adequate publicity for the results of the test.

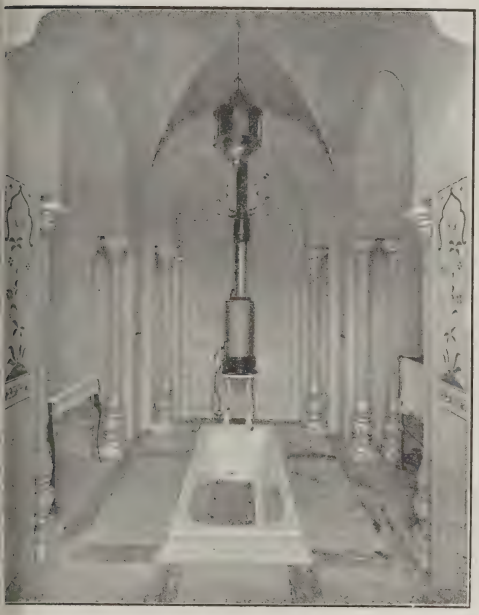
"Safety" of Electricity.

In the "Memoranda" last week, reference was made to a fire which occurred at the Royal Sussex County Hospital at Brighton, and which again illustrated the danger of installing electric wires in close proximity to gas-pipes. In that case the fusing of an electric wire melted the gas-pipe, and ignition followed. Since then, there has been a fire at Doncaster at a piano shop and warehouse in Hall Gate, which was also due to the fusing of two electric wires. The heat from the fused wires melted a gas-pipe, and precisely the same thing happened. The gas escaped, was ignited, and the floor boards caught fire. These illustrations should be a warning to those who wire houses in which gas pipes are already located. Recently James Hannon received a fatal shock while working at the Orgreave Colliery Coke Ovens, near Sheffield. It seems that the man leaned over a handrail in order to loosen some coke; and in doing this he caught, with a hooked iron bar he was handling, an overhead trolley wire at 275 volts. The ground he was standing on was very conductive, being composed of damp coke breeze. A verdict of "Accidental death" was returned. We also see that three men were severely burned at the Hull Corporation Electricity Station last Saturday week. Additions were being made to a 6000-volt switchboard gear, when there was a severe short circuit, which had the effect of temporarily disconnecting the main turbines. There was an explosion, and a tremendous flash of flame. In addition to injuring the men to such an extent that two of them had to be detained in hospital, the supply of electricity was temporarily cut-off from one district.

"The Conversion of Coals into Oils."—This book, by Dr. Franz Fischer, has been translated by Dr. R. Lessing, and is now published by Messrs. Ernest Benn, Ltd., at 36s. net.

THE GAS EXHIBIT.

SUPPLEMENTARY VIEWS.



The Bathroom, with Gas Water-Heater
Supplying both bath and hand basin with hot water, in the "Indian" Section of the Gas Exhibit.

Ice-Making and Refrigerating Plant in the "Indian" Section of the Gas Exhibit.
This is operated without machinery. Heating only over a gas-ring results in the production of small blocks of ice convenient for use in drinks as well as for cold storage purposes.

POTTERY-MAKING BY THE DISABLED EX-SERVICE MEN EMPLOYED BY THE ASHTEAD POTTERY
The pottery is baked in the gas-fired oven to be seen on the left.

BENZOLE RESEARCH.

Second Report of the Joint Benzole Research Committee.

The Second Report of the Benzole Research Committee of the National Benzole Association and the University of Leeds deals in detail with the corrosion test for benzole and other motor spirits, with laboratory experiments on various kinds of active carbon and silica gel, and with visits to working plants where benzole is being recovered by the new method of adsorption.

The account of the research work of Mr. W. H. Hoffert bears ample evidence to indicate that he is a worthy successor to Prof. E. C. Williams as Research Chemist to the Committee.

Sulphur in Benzole.—Certain benzole motor spirits, though free from sulphuretted hydrogen and containing not more than the 0·4 p.ct. of sulphur allowed by the National Benzole Association specification, having been proved to have a marked corrosive action on copper, were subjected to careful examination. Such benzoles cause trouble in motor engines by attacking copper and brass parts such as floats, gauzes, feed tubes, &c., forming black deposits which flake-off and lead to choking of gauzes and jets and to vexatious renewals of corroded parts. The corrosive deposit was found to consist of cuprous and cupric sulphides. It was discovered that certain benzoles of a corrosive nature contained appreciable quantities of free sulphur; and this led to an investigation of the action on copper of solutions of sulphur in benzole of known source and purity. It is interesting to note that—as was established by these investigations—the presence of certain impurities in the benzole tends to inhibit or prevent corrosion of the copper, and that the concentration of free sulphur required to cause corrosion depends on the nature and amount of such impurities. In carrying out these tests, preliminary treatment of the copper surface was found to have a marked influence on the corrosive effect; the most sensitive surface being obtained by mechanical polishing, rather than by chemical cleaning.

After an examination of the published methods of determining free sulphur in benzole, a modification of the method of Ormandy and Craven was adopted. Briefly, the modified test consists in removing the sulphur from the benzole as mercuric sulphide by shaking with mercury, then treating the sulphide with concentrated hydrochloric acid and absorbing the sulphuretted hydrogen thus evolved in an ammoniacal solution of cadmium acetate. Excess of iodine is added, and the back titre obtained with thiosulphate.

Consideration is given in the report to the "doctor" test commonly used in America for the detection of objectionable sulphur compounds in petroleum fractions. This consists in shaking the sample with sodium plumbite solution and free sulphur. If the sample is discoloured, or if the yellow colour of the sulphur film is noticeably masked, the test is reported as positive, and the sample is condemned. After giving results of experiments on the action on copper of organic sulphur compounds in benzole, and data of other investigations, including explanations of the formation of free sulphur, this section of the report concludes without definitely recommending a specification test for determining the corrosive action of a sample of benzole, seeing that the work is still proceeding.

Active Carbon v. Silica Gel.

The second section of the report deals with tests comparing active carbon and silica gel as adsorbents. The samples of active carbon examined were:

1. German active carbon (Bayer T Kohle).
2. American coconut charcoal of high retentivity.
3. Urbain active carbon or coal ("charbon actif").

The respective quantities of benzole taken up by these carbons and by silica gel when saturated at 20° C. with a benzole-air mixture containing 0·86 p.ct. by volume of benzole vapour (the amount ordinarily present in coal gas) were as follows, expressed as percentage weights of adsorbent: Urbain carbon, 36; coconut charcoal, 32; Bayer T carbon, 28; and silica gel, 18. In spite of these differences, the efficiencies of adsorption were practically the same in each case—about 98 p.ct.; twice as much gel, by weight, being required to extract the same amount of benzole as with Urbain carbon.

The influence of temperature on the adsorptive capacities, at saturation, of the T carbon and silica gel was the next subject for investigation. The decrease in adsorptive capacity occurring with a given rise in temperature was found to be much less than is the case with wash oils.

Experiments carried out on the influence of aqueous vapour on the adsorption of benzole proved that silica gel adsorbs the water vapour and removes it quantitatively from the air mixture, but nevertheless shows a fairly high adsorptive capacity for benzole under recovery conditions. It may seem surprising that the gel takes up benzole at all, since the vapour is present at considerably lower partial pressure than the aqueous vapour. That the gel at first takes up more benzole than water arises from the fact that, though the volume of water vapour present in the gas mixture is two to three times that of the benzole vapour, a given volume of benzole vapour yields 4·33 times as much liquid by weight as an equal volume of water vapour. The benzole thus fills up the pore space before sufficient water reaches the gel.

Active carbon, on the other hand, preferentially adsorbs the benzole, and the presence of water vapour does not affect the efficiency up to the break-point. The adsorptive capacity at the break-point and at saturation is, however, slightly reduced; the respective percentage weights for a sample of active carbon being 20·3 and 22·5, instead of 26·0 and 28·0 in the absence of water vapour.

In comparing Bayer T carbon, which has low retentivity, with coconut charcoal, which has high retentivity, no appreciable difference in efficiency of adsorption was observed. The difficulty experienced in removing the adsorbed benzole from the latter is regarded as significant from the point of view of steam consumption on the commercial scale, and possible "poisoning" of the carbon by high-boiling substances.

It was concluded from the results obtained by Hoffert, and those already given in the first report, that for a gas containing 0·86 p.ct. by volume of benzole vapour (2½ gallons per 12,000 c.ft.) and saturated with water vapour at 18° C.—that is, under conditions corresponding approximately with those of large-scale practice—the maximum quantities of benzole taken up at saturation by active carbon and silica gel would be as follows:

	Grammes Benzole Adsorbed per 100 Grammes Adsorbent.	Grammes Benzole Adsorbed per 100 c.c. of Adsorbent Space (material, 5—8 mesh).
Active carbon	15 to 30	5·8 to 11·6
Silica gel.	8 to 14	5·7 to 10·0

Thus, though the active carbon shows a considerably higher adsorptive capacity for benzole than does silica gel under benzole-recovery conditions as calculated on the *weight* of the adsorbent, the quantities taken up by these adsorbents as calculated for a given *volume* are very nearly the same, owing to the greater density of the gel.

As Urbain had stated that his experiments on silica gel did not agree with those of Williams (First Report, 1924), and Chaney found silica gel to be valueless in presence of moisture the investigations in question were repeated by Hoffert, who confirmed the results of Williams. In Hoffert's test, with an air mixture containing 0·88 p.ct. of benzole and 2·05 p.ct. of water by volume, silica gel took up 11·6 p.ct. by weight of benzole and 6·2 p.ct. by weight of water at the break-point. On continuing the test beyond the break-point, the benzole left in the gel after 2000 minutes dropped to 0·4 p.ct. by weight.

The effects of variation of temperature on the recovery of benzole from a benzole dry-air mixture by active carbon, silica gel, and creosote are compared in an interesting way; the result being as follows:

Percentage Reduction in Quantity of Benzole taken up at 15° C. caused by Increase in Temperature.

Active Carbon.	Silica Gel.	Creosote.
1·2*t* ..	1·38*t* ..	2·74 (Bunte and Frei) 3·7 (Rhead)

where *t* = number of degrees above 15° C.

Thus, by increasing the temperature from 15° to 35° C the adsorptive capacity of active carbon is reduced 24 p.ct silica gel 28 p.ct., and creosote over 55 p.ct.

When water vapour was present, the factor for silica gel was found to be 1·5 *t*—not very different from the foregoing.

It was found that in the case of active carbon, provided that the temperature of adsorption is 10° to 15° C. higher than the temperature at which the air is saturated with water vapour the presence of the latter has practically no influence on adsorption.

Active Carbon Plants.

The remainder of the book of 246 pages is devoted mainly to reports on active carbon plants, and on the quality of the benzole made by these.

The Bayer plant at Leverküsen, near Cologne, was working on purified town gas, and was dealing with up to 70,000 c.ft. of gas per 24 hours, obtained from Ruhr coal of poor quality. Two filters, each containing 5½ cwt. of T carbon to a depth of about 40 in., worked in series, and were preceded by a prefilter which held 2 cwt. of cheap B carbon for removing naphthaler. The contents of the prefilter required renewal every eight weeks, and the naphthalene was driven-off, and the carbon reactivated by carbonization at 600° to 900° C.

The gas, after leaving the prefilter, passed through the two filters in series, and travelled downwards through the active carbon layer, as it was found that the "pulsing" which occurred when the gas flowed upwards caused powdering of the material. When the first filter became saturated, it was cut out of the system, and closed steam at about 70 lbs. pressure was turned on, passing through concentric coils in the filter. As soon as the whole filter reached 100° C., open steam of a similar pressure to the above was allowed to expand directly into the top of the filter, and was turned off when no more benzole flowed from the condenser.

After steaming, the filter was put into operation again at once; the debenzolized gas from the filter still in operation being used to cool and dry the steamed carbon—the cooling of the latter being rapid, owing to loss of heat by evaporation of the water remaining in the carbon. In this way each filter was

ccessively saturated, steamed-out, and put on in series after e other, which had meanwhile been working alone. The eam consumption was said to be about 3 lbs. per lb. of benzole covered; but a trial run gave a higher figure.

When the plant was inspected, the active carbon in the filters d been in use for six months, during which time 3 to 4 tons benzole had been obtained. There was no evidence that the sorptive power of the carbon had decreased appreciably during at time. The benzole recovered was light yellow in colour, ntained 0·5 to 0·9 p.ct. of sulphur (chiefly as carbon bisul- ide), and distilled 95 p.ct. to 140° C. There was apparently specification in Germany for benzole used as motor spirit, d the benzole was used as recovered in motor cars, and on a H.P. "Mercedes" test bench motor, in which no trouble had far been experienced.

A plant on similar lines to the above had been erected at ils, near Recklinghausen, for the extraction of benzole from purified coke-oven gas, but had not been put into operation, ring to political and economic difficulties in the Ruhr. rangements had been made for the gas from a battery of 60 to coke ovens to be sent either to the scrubbers for the re- oval of benzole by oil-washing, or to the newly-erected plant recovery of both sulphur and benzole by means of active bon. The scheme is as follows: The gas, 3½ million c.ft. day, first passes through the filters for sulphur recovery, d then through the benzole filters. In the former sufficient ygen (1 p.ct.) is added to the gas to promote the reaction $H_2S + O_2 = 2\,H_2O + 2\,S + 111$ calories, which takes place the presence of active carbon. A little ammonia is added to as catalyst. A special form of active carbon (F carbon) is ade from lignite by the Bayer Company for this process, and reaction proceeds at the ordinary temperature. Three phur filters are installed. At any time one filter can be used the removal of sulphuretted hydrogen, a second filter can be racted with a solvent to remove the sulphur from the active bon, and the third can be steamed-out, and dried by the gas ning from the first filter. The solvent preferred is am- nium sulphide, and each filter in turn is filled with a solution this chemical, as it is found that mere percolation through carbon does not dissolve the sulphur. If removal of the phur is found to be incomplete, arrangements are made for a al wash with monochlorbenzene. The ammonium polysul- ide obtained is decomposed by steam, with precipitation of phur, which is filtered and centrifuged; and the ammonium phide is used over and over again. The benzole filters are bstantially of the same design as those at Leverküsen.

A benzole plant working with active charcoal on purified gas Bernau Gas-Works, Germany, is also described. This had n in operation for three months at the time of the visit. A phthalene prefilter was not used; and superheated steam at 0° C. was employed for stripping the benzole. The latter was y faintly coloured, contained 0·5 p.ct. of sulphur, and dis- ed 90 to 95 p.ct. up to 120° C. It was claimed that it worked fectly as a motor fuel, and caused no formation of carbon or n in the engine. About 3·4 lbs. of steam per lb. of benzole re necessary for stripping the benzolized carbon; but to this ire must be added an allowance for superheating. No loss efficiency of the carbon had so far been observed.

The Bayer Company are credited with making the following erent kinds of active carbon:

. H, ordinary. Made from wood. Sp. gr. 0·25.
. T. Made from peat. Sp. gr. 0·4. Improved form for benzole, &c.
. B. Cheap form for naphthalene and "tar-fog." Sp. gr. 0·6 to 0·7.
. F. Made from lignite. Sp. gr. 0·3. For removal of sulphuretted hydrogen.
. E. Decolorizing carbon. Screenings from the other types.

The Grenoble plant, in which Urbain active carbon was being d, was inspected, and is described in the report. Dr. Urbain med to have produced a carbon superior to the Bayer pro- t; and at the plant installed at the Grenoble Gas-Works e filters were in operation at the time of the visit—two filled h Bayer T carbon (880 lbs. in each), and one with Urbain bon (770 lbs.). The filters worked in parallel, and there was prefilter for naphthalene removal. The gas treated was ified in the usual way with oxide; and a volume of about ,000 c.ft. per day was being debenzolized. In normal opera- two filters were adsorbing in parallel while the third was ng steamed. Each filter operated on a 12-hour cycle; the orption period being 8 hours. They had been in com- sion for 2½ months (about a year ago).

The method of removing the adsorbed benzole was by first ting the carbon to 100° C. by means of an internal steam for 30 to 40 minutes with steam at 70 lbs., and then passing erheated steam at 7 lbs. and 250° C. directly into the top of filter for half-an-hour. After driving-off the benzole, the r was dried by heating the carbon by means of the internal im coil while gas was passing through. The average steam sumption was 2½ to 3 lbs. per lb. of benzole; but a ratio of 1 was claimed under optimum conditions. At the maxi- m gas speed for which the filters were designed (175 c.ft. per ute per filter) the loss in gas pressure was 1½ to 1¾ in. of er; and in this respect at any rate the Urbain filter was inctly better than those filled with Bayer carbon. The re- cords of the plant appeared to substantiate the claims that the Urbain carbon was also slightly superior to the Bayer product in rate of adsorption and in capacity, as well as in resistance to disintegration.

The quality of the benzole obtained was very good. It was practically water-white, and the evidence would seem to indicate that benzole of better appearance is obtained when superheated steam is used instead of saturated steam for stripping the carbon. The sulphur content was 0·57 p.ct. by weight; more than half of this being in the form of carbon bisulphide. Distillation of the benzole yielded 94 p.ct. at 125° C.; and a copper dish test gave only a small quantity (0·017 gramme per 100 c.c.) of brown resin.

As regards the possible use as motor spirit in this country of unrefined benzole recovered direct from coal gas by means of active carbon, some doubt is expressed as to whether such motor spirit would be acceptable, or would pass the present specification tests. So far, on the Continent, only limited supplies of carbon-recovered motor benzoles have been available, and these have been used as soon as recovered, before any appreciable polymerization of the gum or resin forming constituents could be expected to take place.

The book concludes with a very full bibliography (21 pages), for 1923 and 1924, of literature relevant to the production and purification of benzole.

As we know that active carbons and silica gels (see "Petroleum Times," April 18, 1925, p. 728) are being improved rapidly, there must be plenty of work before the Benzole Research Committee; and we look forward with great interest to the publication of further valuable investigations.

EVENING STAR LODGE, No. 1719.

On Wednesday evening last the regular meeting of the Evening Star Lodge, which is always held on the fourth Wednesday of the month of May, took place. W. Bro. Hermann L. Sheppard was in the W.M. chair; that of the S.W. being occupied by Bro. A. H. Henry, and that of the J.W. by Bro. Frederick G. Cockey.

First, W. Bro. E. G. Smithard, of King's Lynn, P.M., P.P.G. Treas., Norfolk, was installed as Treasurer of the Lodge for the year 1925-26, he having been prevented from attending the last meeting, when the appointment and installation of the other officers was carried out.

Three candidates for initiation were then ballotted for; and the W.M. declared each of them unanimously elected. They were: Mr. Wilfred Baker Claridge, Manager, Engineer, and Secretary of the Marlborough Gas Company, Wilts; Mr. James Waldron Swan, Assistant Manager and Secretary of the Hitchin Gas Company, Herts; and Mr. Leslie Walter Dunn, Engineer-in-Charge at the Linacre Works of the Liverpool Gas Company, Bootle, on new constructional work.

The initiation of Mr. Claridge was then carried through by the W.M., W. Bro. Valon, P.M., L.R., assisting; the office of J.D. being discharged by W. Bro. James Foreman, and that of S.D. by W. Bro. A. L. Croager.

Reference was made to the Emergency Meeting of the Lodge, which is to take place in the Grand Temple of Freemasons' Hall on Monday, June 8, when about two hundred masonic members of the Institution of Gas Engineers are expected as guests, on the eve of the opening of the Institution's Annual Meeting.

The Lodge having been closed, the members and visiting brethren dined together in the Connaught Rooms—W. Bro. Sheppard presiding as W.M. After the Loyal Toasts, the health of the W.M. was pledged at the call of W. Bro. Rae P. Normand, I.P.M., and W. Bro. Sheppard, after expressing his acknowledgments, proposed "The Immediate Past Master," who responded. To the toast of "The Initiate," submitted by the W.M., Bro. Claridge suitably replied; and W. Bro. Jacques Abady, P.M., L.R., gave that of "The Visitors," which was responded to by Bro. William Claridge, of the Harpenden Lodge No. 4314 (father of the initiate), Bro. B. L. Thomas, of the Centre Lodge, No. 3701, and Bro. H. F. Mainwaring, of the Sir Francis Drake Lodge, No. 4375. "The Past Masters and Officers of the Lodge," given from the chair, was acknowledged by W. Bro. E. G. Smithard, P.M., on behalf of the former, and by W. Bro. A. L. Croager, on behalf of the latter.

An excellent musical programme was provided.

Visitors at the Institution Meeting.

At the annual meeting of the Institution of Gas Engineers, which opens at the Institution of Civil Engineers on Tuesday, June 9, a number of distinguished visitors and members from overseas are expected. They will be welcomed at the commencement of the proceedings by the President, Mr. J. Ferguson Bell, M.Inst.C.E., of Derby. The Rt. Hon. J. H. Thomas, M.P., the Rt. Hon. Sir Alfred Mond, M.P., and Mr. Woolley (Chairman of the Derby Gaslight and Coke Company) will respond on behalf of the former, and the Hon. George Swinburne, of Melbourne, will speak for the latter.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

June 5.—Southern Association of Gas Engineers.—Visit to the works of the Bournemouth Gas and Water Company.

June 6.—Scottish Junior Gas Association (Eastern District).—Annual outing at Anstruther.

June 6.—Yorkshire Junior Gas Association.—Visit to the works of the Wakefield Gaslight Company.

June 6.—Society of Engineers.—Visit to Welwyn Garden City. A short descriptive lecture on the aims of the Garden City will be given by Sir Theodore Chambers, K.B.E.

June 8.—Institution of Gas Engineers.—Council meeting at No. 28, Grosvenor Gardens, at 2.15.

June 8.—Evening Star Lodge.—Regular meeting, at 5 p.m., in the Grand Temple of the Freemason's Hall, Great Queen Street, London.

June 9-11.—Institution of Gas Engineers.—Annual general meeting in the Great Hall of the Institution of Civil Engineers, Great George Street, Westminster. At the termination of Thursday's meeting, a Council meeting will be held at the Institution of Civil Engineers.

June 10.—Association of Statutory Inspectors of Gas Meters.—Annual general meeting at the new County Hall, Westminster. The afternoon will be devoted to a visit to the Finsbury gas meter testing office.

June 11.—Coke Oven Managers' Association (Midland Section).—Visit to the Barugh plant of Low-Temperature Carbonisation, Ltd.

June 12.—Institution of Gas Engineers.—Visit to Derby. Members should note that the luncheon will be in the Drill Hall, Derby—*not* the Assembly Rooms, as indicated in the programme.

June 19.—Industrial Gas Salesmen's Circle.—Meeting at the Council House, Birmingham. Inspection will be made of the industrial gas demonstration rooms and research laboratories of the Birmingham Gas Department, and visits will be paid to the Windsor Street heat treatment shops, and to the works of the Moss Gear Company, Ltd.

June 20.—London and Southern District Junior Gas Association.—Visit to the Cambridge Gas-Works.

June 30.—Last Day for Coke Competition Papers.

July 9.—Coke Oven Managers' Association (Midland Section).—Visit to the works of Messrs. Stainby and Lyon, of Knottingley.

July 20-25.—Royal Sanitary Institute.—Congress at Edinburgh. H.R.H. the Duke of York has accepted the Hon. Presidentship of this Congress, at which Sir John Gilmour, Bart., Secretary for Scotland, will preside, and deliver the Inaugural Address. A health exhibition is to be held in connection with the Congress.

SCOTTISH JUNIOR GAS ASSOCIATION.
(EASTERN DISTRICT.)

Visit to Leslie and Markinch.

The Association paid a visit to the gas-works at Leslie and Markinch on Saturday, May 16. There was a good attendance of members; the party including Mr. David Vass (Perth), and Mr. J. J. Scott (Cowdenbeath), honorary members.

Mr. Henry Gourlay, Manager of the Markinch Gas-Works, met the visitors at Markinch Railway Station, and the party proceeded to the Leslie Gas-Works. On arrival, they were received by Mr. John Letham, Manager of the Leslie Gas Company, Ltd.; and Mr. Anderson extended a hearty welcome on behalf of the Directors. A tour of inspection was made. A feature of the plant was a new setting of horizontals erected by Messrs. R. & G. Hislop, of Paisley.

The visitors then proceeded to the Markinch Gas-Works, where they were welcomed by Mr. Allan, Secretary of the Markinch Gas Company, Ltd. He expressed the hope that their present visit would be as enjoyable as the last, in 1921. Mr. Gourlay conducted the party over the works, and explained the various improvements and extensions which are to be carried out. An inspection of the gas engines at the power house of the adjacent water works completed a very interesting afternoon.

Following the inspection, the visitors were conveyed to the Town Hall, and hospitably entertained at tea by the Leslie and Markinch Gas Companies.

Mr. Alan Clark (Perth), Vice-President, in the absence of Mr. Laing (Brechin), the President, expressed the thanks of the members for the enjoyable and interesting afternoon they had spent.

Mr. Anderson replied on behalf of the two Companies. I remarked on the benefits which accrued from membership the Scottish Junior and kindred Gas Associations, both to mer bers themselves and to the undertakings they served. T intercourse between members engaged at different works, a the present-day facilities afforded for inspecting other wor and plant, were of valuable assistance. In his opinion, a wid application of the same principle to other industries wou greatly improve industrial conditions generally.

Mr. David Vass (Perth) added a few words in appreciati of the visit and the courtesy with which they had been w comed.

The concluding item on the syllabus of the Association this session is the annual outing, which will be held at A struther on Saturday, June 6. An inspection of the Anstruth Gas-Works, and also an oilskin factory, will take place in t forenoon. After luncheon, at the kind invitation of t Anstruther and Cellardyke Gas Company, Ltd., golfing a bowling competitions will be held; the visit concluding with i in the Gas Company's showrooms. On this occasion, la friends of members are cordially included in the invitation.

FORMS OF PYRITES IN COAL.

At a recent meeting of the Manchester Geological and Mini Society, Mr. J. Lomax read a paper, entitled "Further I searches on the Various Types of Pyrites in Coal, Especially Relation to Spontaneous Combustion," based upon work d in the laboratories of the Lancashire and Cheshire Coal I search Association. From this the following extracts have b made.

Crystalline Pyrites is often found in strong coals, but seldom noticed, on account of being enclosed in a pocket-l lenticel. Some lenticels are quite small; others comparativ large. When broken, they are found to contain well-formed beautiful crystals. Under normal conditions these are usu non-oxidizable, and therefore harmless from the point of v of spontaneous combustion.

Massive Pyrites consists of irregular blocks, which frequen occur as lenticels, usually embedded in a matrix of soft c The coal matrix is very friable, and on exposure quickly comes detached, leaving the pyrites free. Originally th blocks were pieces of wood of varying sizes; the vegetative structure could still be detected. This type is often found coal seams, especially in the Lower Coal Measures. The c clusion with regard to the massive banded pyrites is though on the surface they are apparently harmless, they rap oxidize under favourable conditions, and must therefore classed among the dangerous types.

Nodular Pyrites occurs as round, oval-shaped nodules in grades of coal, but is most frequent in the soft inferior co the vitrain or clarain varieties. Often such coal is trave by vertical joints, some filled with pyrites. Between the rain and the pyrites there is a thin layer of fusain. Such la cause splitting of the coal in the immediate area. A l block of moderately hard coal, in which a layer of this soft occurred, was cut-out to separate it from the surrounding m After five days' exposure in a dry room the coal surrounding pyrites was broken-up by a large number of radial cracks, the more fragile material in contact with the pyrites fell dust and slack. When this type of pyrites occurs in quanti under favouring conditions, it is undoubtedly a source of s taneous combustion.

Stringy Pyrites occurs in most coal seams; the string veins running parallel with the bedding planes of the coal specimen obtained from the Deep Mine of the Wimble Colliery Company at Hednesford was of an unusual chara the strings or veins occurred at right angles to the bed planes of the coal. The structure of the coal substance similar to that of many other coal seams. It was compos bands of soft coal easily fractured. The constituents chiefly the remains of vitrainized wood, broken-down laminæ, thin layers of microspores, occasional megasp resinous bodies, and small lenticels of fusain. It was a cult matter to estimate whether this type was a source of da as the strings were usually found in a fully pyritized condi but it was very seldom that oxidation took place. It may, t fore, be regarded as harmless under normal conditions.

Globulites.—In many coal seams there frequently occur l and lenticels composed of myriads of small shot-like b To this form of pyrites the term "globulites" was ap Usually a brown substance forms the inner portion, and p forms the outer shell or crust. Occasionally, they are posed of pyrites only. These bodies have undoubtedly bee rived from vegetative tissues. Globulites occur in all cl of coal as isolated bodies or aggregations forming ban varying thickness. They are not regular, although they extend over considerable areas. If partially pyritized, v is usually the condition in which they are found in the classes of coal, oxidation as a rule is very rapid, and the is quickly reduced to fine slack.

"FIELD'S ANALYSIS" FOR 1924.*

HE new edition of "Field's Analysis" dealing with the gures for the year 1924 has just come to hand, and, as usual, found to provide many interesting facts for the consideration all and sundry connected with the gas industry.

There is nothing special to remark upon in the make-up of is year's publication, which is issued in the form to which e are now becoming accustomed, and which still retains (as e think it should) working results based upon per 1000 c.ft. gas sold as well as per therm. There may be some, but irely very few, in the industry who would be prepared to say iat the per 1000 c.ft. basis could, in this work, be done away ith altogether, even in the event of the whole of the under-kings coming under the Gas Regulation Act.

In reviewing the figures presented to us in the past, it has een our custom to confine attention to groups rather than to dividual undertakings; but on this occasion it is proposed to apart from this practice, as there is an exceptional fact to cord. We make no apology for so doing, as it has reference the largest, and therefore the most important undertaking the country—viz., the Gas Light and Coke Company. On rning to p. 6 of the "Analysis," we find under "Net Coal and 'orking Expenses" a column which represents the total cost working without taking into consideration capital charges any kind; and this shows that the Gas Light and Coke Com-iny accomplished the feat for the first time within memory of eating not only their immediate neighbours but also all the uburban Companies included in the Analysis. Comparisons, course, are odious; but the Gas Light and Coke Company ave so often stood the brunt of adverse criticism in the past—erited or otherwise—that no one will object if the limelight is ow turned in other directions in order that this Company may eceive whatever praise is due to them. For this purpose there in be no better comparison than that provided by the South letropolitan Company, who have always been regarded as a odel Company. In their case the total cost is 7·686d. per nerm, as against 7·509d. for the Gas Light and Coke Com-iny. The main items comprising these figures are as follows:

	Gas Light. Per Therm. Pence.		S. Met. Per Therm. Pence.
Net coal	1·658	..	1·636
Manufacture—			
Salaries and wages	0·562	..	0·756
Purification	0·057	..	0·166
Wear and tear	1·740	..	1·542
Distribution	2·081	..	2·266
Rates and taxes	0·678	..	0·340
Management	0·366	..	0·515
Co-partnership	0·094	..	0·178
Other charges	0·273	..	0·287
	7·509	..	7 686

From this statement it will be seen that the disadvantage of aving a larger rateable value (in consequence presumably of ie greater gross profit that has to be made by the Gas Light nd Coke Company), bringing in its train an excessive charge or rates, is overcome by less expenditure in other directions. Vear and tear of works plant is higher; and it is interesting refer to the expenditure under this head during the last our years—*i.e.*, since the introduction of the Gas Regulation ct. The figures extracted are as follows:

	Gas Light. Per Therm. Pence.		S. Met. Per Therm. Pence.
1921	2·707	..	1·774
1922	2·573	..	1·723
1923	2·271	..	1·618
1924	1·740	..	1·542

he question immediately arises as to the effect of this greater xpenditure upon the price of gas. Here, however, we find iat the policy has not had a detrimental effect, as, notwith-anding this larger expenditure, the price of gas charged by ie Gas Light and Coke Company, as shown by the "Net Gas ental," is only increased by 50 p.ct. over pre-war days—viz., om 5·37d. per therm in 1913 to 8·11d. in 1924—a moderate ercentage when compared with most other commodities. One f the reasons for this is, of course, the fact that the post-war apital charge is very little greater than that experienced in re-war days—a fact which is all to the advantage of the con-umers.

This matter, in its bearing upon the charge which the con-umers might reasonably be called upon to pay, can be viewed n another way—viz., by taking the position of the Gas Light nd Coke Company in pre-war days relatively with the South letropolitan Company. The "Net Gas Rental" charges in 913 for these Companies were as follows.

Gas Light	5·369d.
South Metropolitan	4·415d.

f the percentage of difference that existed then is applied to the South Metropolitan prices from 1921, we obtain the following figures:

	Net Gas Rental—Per Therm. Pence.
1921	12·623
1922	12·374
1923	9·907
1924	9·187

Whereas the actual figures for the Gas Light and Coke Company were:

	Per Therm. Pence.
1921	13·117
1922	11·205
1923	8·861
1924	8·110

On this basis there is a total reduction over the period of no less than 2·798d., which would have been further enlarged to 5·432d. had it not been for the increased expenditure of 2·634d. on "Wear and Tear, Manufactory."

Translating the charge of 5·432d. per therm into its cash equivalent, we arrive at a sum of over £3,000,000, of which it may be said the consumers have received one-half, the balance having been spent on further improvements in the works of the Company, in order that the benefit of still cheaper gas may be in store for them—a fact which would appear to be already indicated by the success achieved during 1924.

That inferences such as these can be arrived at by reference to present and past editions of the "Analysis" illustrates in a marked degree the value of the material furnished by the work; and it would almost appear to make it imperative that the familiar red covers should lie within easy reach of every gas manager or official concerned in administrative work in the industry.

With regard to the other figures to be found in the "Analysis," attention should be drawn to the continuance of the splendid progress that has been such a marked feature throughout the industry generally during the last few years. The year under review was, in fact, a culminating one, since only one undertaking out of the 35 dealt with experienced a decrease—viz., Widnes—who were unfortunately down, but only to the very small extent of ¼ p.ct. The average increase for the whole of the undertakings included in the Analysis was no less than 6½ p.ct.—a result which was contributed to by a satisfactory increase in the number of consumers of 3·3 p.ct., and a still more satisfactory increase in the number of stoves let out on hire of no less than 7·42 p.ct. The Richmond Company disappear from the Analysis, as they have been absorbed by Brentford; but the vacancy is taken by the North Middlesex Company, whose advent into the charmed circle is heralded by a winning figure in the vitally important matter of output—an increase of no less than 14½ p.ct. having to be recorded. In the London area—presumably on the same day—every Company but one reached its maximum output, some very fine figures being recorded. Among the Provincial Companies it is noticed that in two cases—viz., Newcastle and Sheffield—the figures are increased as against the corresponding figures of a year ago by reason of amalgamations with other smaller concerns.

As was to be expected, many deficits are shown in the case of the undertakings which ended their year on Dec. 31 last, in consequence, of course, of the slump that began to show itself in the market for secondary products towards the latter part of last year. In the case of the Corporations, where the year ends at an earlier stage, there is only one deficit—viz., that of Edinburgh.

The effect of the decline in the secondary products market can be gauged from the following figures, which show in the first place the cost of coal per therm for the two years 1923 and 1924, and, secondly, the cost of "Net Coal" over the same period:

Cost of Coal per Therm Sold.

	Gas Light. d.	Comml. d.	S. Met. d.	Met. Cos. d.	Subn. Cos. d.	Provl. Cos. d.	Dublin Co. d.	Provl. Corpns. d.	Scottish Corpns. d.
1923	4·919	5·685	4·999	4·995	5·991	4·842	6·245	4·926	4·410
1924	4·875	5·906	4·986	4·975	5·832	4·978	6·659	4·583	4·724

"Net Coal" per Therm Sold.

1923	1·465	1·366	1·292	1·405	2·647	1·767	1·663	1·971	1·393
1924	1·658	1·848	1·636	1·663	2·859	1·994	1·378	1·243	1·182

It will be seen that, while the cost of coal has remained more or less stationary, the charge for "Net Coal" has progressed upwards in all cases with the exception of the Dublin Company and the Corporations; the reason for this latter exception being found in the fact mentioned above—that the year for the Corporations is completed at an earlier stage.

It is impossible to give an adequate review of a work of this kind, in which every figure, every line, and every column tells a tale. There is almost inexhaustible interest in the work, and upon it we heartily congratulate the Editor, Mr. H. E. Ibbs, and all who have assisted him in any way in securing and preparing the data, which, in large part, record the continued and material advance of the gas industry in the service of the community.

* "Field's Analysis of the Accounts of the Principal Gas Undertakings in England, Scotland, and Ireland," for 1924. London: Eden Fisher & Co., Ltd. Price £2 2s. Orders may also be sent to the "JOURNAL" Office.

NATIONAL GAS COUNCIL OF GREAT BRITAIN AND IRELAND.

SEVENTH ANNUAL GENERAL MEETING.

THERE was a very large attendance of members at the seventh annual general meeting of the National Gas Council, which was held on Tuesday afternoon of last week, at the Hotel Great Central, Marylebone Road, London, N.W.; and an innovation was the presence of members of the General Press. Mr. D. MILNE WATSON, D.L., occupied the chair at the meeting, and also at a luncheon which followed.

At the opening of the proceedings the minutes of the sixth annual general meeting, having been circulated, were taken as read, confirmed, and signed.

MEMBERS OF THE CENTRAL EXECUTIVE BOARD REPRESENTING DISTRICT EXECUTIVE BOARDS AND ASSOCIATED BODIES.

The SECRETARY (Mr. W. J. Smith) reported the following list of members of the Central Executive Board appointed and nominated respectively by the District Executive Boards and Associated Bodies:

Eastern District.—Messrs. T. Glover, C.B.E., M.Inst.C.E., Norwich; W. H. Mainwaring, Lincoln; R. G. Shadbolt, Grantham; and W. W. Townsend, Colchester.

Irish District.—Messrs. R. Bruce Anderson, A.M.Inst.C.E., Waterford, &c.; W. J. Grey, A.C.A., Dublin; Joseph McNicholl, Cork; and J. D. Smith, J.P., M.Inst.C.E., Belfast.

London District.—Messrs. F. J. Bradfield, F.C.I.S., Commercial; Archibald Caddick, Croydon; Thomas Hardie, M.Inst.C.E., Gas Light and Coke; and Frank H. Jones, M.Inst.C.E., Wandsworth, &c.

Manchester District.—Messrs. G. S. Frith, Runcorn; Fred. A. Pye, Chester; W. J. Smith, B.Sc., Bolton; and S. Tagg, M.Inst.C.E., J.P., Preston.

Midland District.—Messrs. Leslie E. Clift, Redditch; Harold Davies, Chesterfield; P. N. Langford, Coventry; and A. W. Smith, Birmingham.

Northern District.—Messrs. Norman S. Cox, Sunderland; Herbert Lees, A.M.Inst.C.E., Hexham; Thos. P. Ridley, F.C.I.S., Newcastle-on-Tyne; and F. P. Tarratt, Newcastle-on-Tyne.

Scottish District.—Messrs. Lawrence Hislop, Cowdenbeath; J. W. Napier, Alloa; Bailie R. G. Slorach, B.L., Hamilton; and Councillor James Stewart, Edinburgh.

Southern District.—Messrs. C. F. Botley, M.Inst.C.E., Hastings; Wm. Cash, F.C.A., Bournemouth; H. C. Head, M.Inst.C.E., M.I.Mech.E., Winchester; and A. Valon, M.Inst.C.E., Westgate and Birchington.

South Wales District.—Messrs W. Clark Jackson, A.M.I.Mech.E., Neath; W. H. Johns, M.I.Mech.E., Swansea; and J. E. Kenshole, Merthyr Tydfil.

South-Western District.—Messrs. J. H. Ellis, Plymouth; S. E. Halliwell, Bristol; S. J. Ingram, Truro; and W. N. Westlake, Exeter.

Yorkshire (W.R.) District.—Messrs. Harold E. Bloor, B.Sc., B.Eng., York; E. H. Hudson, Normanton; Arnold E. Mottram, Ossett; and C. Wood, O.B.E., F.C.S., Bradford.

Institution of Gas Engineers.—Messrs. J. Ferguson Bell, M.Inst.C.E., Derby; C. F. Botley, M.Inst.C.E., Hastings; Samuel Tagg, M.Inst.C.E., J.P., Preston; and John Wilkinson, O.B.E., Nottingham.

British Commercial Gas Association.—Messrs. R. Halkett, Sheffield; Ald. J. H. Lloyd, M.A., J.P., Birmingham; Ald. F. S. Phillips, J.P., Salford; and D. Milne Watson, D.L., Gas Light and Coke Company.

Gas Companies' Protection Association.—Messrs. R. W. Edwards, Aldershot; D. H. Helps, M.Inst.C.E., Reading; and A. A. Johnston, Brentford.

THE REPORT.

The annual report, which was then submitted, will be found in last week's "JOURNAL," p. 586.

MR. MILNE WATSON'S ADDRESS.

The PRESIDENT, who was received with applause, said: It is now my duty to move: "That the annual report and audited statement of accounts for the twelve months ended March 31, 1925, as circulated, be approved and adopted." Before, however, proceeding to put that motion to the meeting, I have one or two things I should like to say to you with regard to past happenings and the present position of the gas industry.

Even a casual glance through the report will show that, as in previous years, the matters dealt with by the Council have been both numerous and varied. We have every reason to congratulate ourselves upon the results achieved and upon the progress made in assisting the gas industry to perform the important—I may say, indispensable—services which it renders to the community.

I do not propose to-day, however, to traverse the ground covered during the past twelve months, important though much of the work has been, but will confine my remarks to one or two subjects which are of outstanding interest and importance not only to the industry, but to the nation at large.

At the outset I would like to refer to an innovation which has been introduced this year. In past years it has been our custom on the occasion of our annual meetings to refrain from drawing public attention to the invaluable services which we, as an industry, are performing. To-day we have set aside our customary modesty, and have invited to join us members of the Press—to whom I feel sure you would like me to extend the most cordial welcome on your behalf—in order that they, at any rate, may be apprised of the national importance of our industry. Their presence here to-day is peculiarly opportune, as it will, I believe, ensure that we in the gas industry get fair play and a square deal in connection with any proposals put forward for artificially stimulating electricity supply.

SCIENTIFIC PROGRESS OF THE INDUSTRY.

The scientific progress made by the gas industry in recent years has been remarkable, and, as one would expect, this progress has been accompanied by a great expansion in the demand for gas. In 1902, the sales of gas in Great Britain amounted to no less than 160 thousand million feet. That figure had risen to 181 in 1907, to 205 in 1912, to 232 in 1917, to 265 in 1922, and this enormous output was yet larger in 1923, when it reached 274 thousand million feet. The figures for 1924 will doubtless show a still greater sale of gas, but even taking the sales for 1923, the increase over those of 1902 is more than 70 p.ct.—a record of which we are all very proud.

This remarkable achievement, which has been due in no small measure to the work undertaken by the British Commercial Gas Association in familiarizing the public with the innumerable ways in which gas can be made to meet the needs of both the industrial and domestic consumer, may to the layman seem phenomenal; but to those of us who are of necessity familiar with the fuel problems of the world, the outstanding position which the gas industry in this country occupies is not, perhaps, so surprising.

Let us examine this subject a little more closely. Nations succeed and localities prosper according as they are blessed with natural resources, and to the extent to which they can successfully adapt such resources, on economic principles, to the best needs of mankind. Natural wealth and natural resources predetermine the particular industry and trade upon which a nation or locality must rely for its prosperity, be it dairy-farming in Denmark, the timber trade in Scandinavia, or cotton-spinning in Lancashire. Conversely, a nation which endeavours to force—as it were in a hot-house—the growth of exotic trades and industries in its midst must ultimately fail in its object.

THE FUEL PROBLEM.

If this subject be investigated yet further, it will be found that the foregoing generalizations are equally applicable and true to-day in connection with the fuel problem existing in this and other countries.

I do not, of course, for one moment suggest that electricity does not fulfil most useful functions in its own special sphere in this country. Thanks to the skill and energy of those engaged in that industry, these functions are most admirably performed. Moreover, electrical apparatus made in this country is known for its excellence throughout the world, and I believe that those engaged in its manufacture, equally with those concerned in the supply of electricity, are second to none in scientific knowledge, resourcefulness, and initiative. I wish to make it clear that we in the gas industry in no way belittle the services of electricity—gas undertakings themselves employ electricity in their works—but I do most strongly emphasize the elementary axiom that this country's greatness has been due in the past, as it is due to-day, to its natural fuel resources. It was the discovery of coal-fields adjacent to iron deposits, and to the sea-board, which made these small islands the "factory of the world." This country has been blessed with fuel resources—other countries with natural water power. The absence of water power in these islands has proved no handicap, as water power is merely an alternative to coal, with which this country has been richly endowed. The broad result has been, as one would naturally expect, that, while in other countries where water power is available the development of electricity supply has been most marked, in this country, where coal is the prime asset, it is the gas industry which has been more successful in meeting the needs of the community.

The gas industry has, after an existence of over one hundred years, become the principal conservator of our invaluable coal supplies, converting them—as it does—into a purified fuel which is easy of transport, capable of storage, and readily adaptable to a thousand uses.

It is due to the fact that the gas industry has concentrated upon the natural resources available and upon their most

economic utilization that its position in this country has become unexcelled—if, indeed, it is equalled—in any other part of the world.

Any comparison between the gas and electricity industries in this and other countries whose natural resources are entirely different must, of necessity, be misleading. Great Britain, with its ample coal resources, must inevitably rely upon the development of the use of gas for fuel purposes, just as the absence of coal resources may compel Continental countries to employ electricity even for heating.

In this country, for both industrial and domestic heating, the use of gas is, by universal consent, admitted to be in all cases the most economical, and in many cases the only practicable, method. I am leaving out of consideration the question of lighting, whether it be by gas or by electricity, as no one can suggest that this is a material factor in the question we are now discussing. The one field in which it can be alleged to-day that electricity leads is power, and admittedly cheap power is very important for this country.

This brings us to this question: Is the cost of power supply in this country excessive? As the result of many inquiries, I find that this is far from being the case. On the North-East Coast electricity for power purposes is as cheap as in Chicago, and twice as cheap as in Switzerland, and in any case it only represents something like 1½ p.ct. of the total manufacturing costs.

In a representative engineering works, I have ascertained that power represents only 0·8 p.ct. of the total manufacturing costs. It is clearly not high power costs in this country which are the cause of trade depression. In fact, even if power were supplied for nothing, it is impossible to suggest that this could result in any appreciable improvement in the trade of the country.

The fact, however, that electricity is employed in this country on a smaller scale than in other countries more favourably placed for its development has suggested to Members of Parliament that this may be one of the major causes of the present industrial depression in this country. Is this so? It is true that Switzerland consumes 700 units of electricity per head of population as against 139 units per head in this country; but this in itself proves nothing. Can current be purchased there at much lower rates than here? Decidedly not.

The essential fact is, as the Parliamentary Secretary to the Ministry of Transport stated in the House of Commons last week, that Switzerland "pays twice as much for its current as we in the North-East of England do." How can it be said then that Switzerland has the advantage?

If electrical enthusiasts were right in their premises, one would expect to find on the North-East Coast infinitely less unemployment than obtains in Switzerland. Is this the case? Most decidedly not! In fact, I do not think I am exaggerating when I say that trade depression and the number of unemployed on the North-East Coast are as great if not greater than obtain on the Continent. Cheap electricity does not spell good employment. Power costs in industry are but a small (and in many cases an almost negligible) factor. This point cannot be over-emphasized; and if it had not been overlooked, I do not believe that Parliament would be following this will-o'-the-wisp to-day. But let us pursue our comparison with the Continent still further. If small consumption of electricity per head of population were a cause of unemployment, it would necessarily follow that other countries with a consumption comparable with our own would be similarly burdened with the problem of the unemployed. Do facts support this theory? Far from it. Both France and Germany consume very little more electricity per head than we do in Great Britain, and yet, as we are all well aware, unemployment in those two countries is practically non-existent. If study is given to the question, it is clear that the consumption of electricity in this country has but little, if any, relation to the volume of unemployment. Sir Robert Horne himself frankly admitted last week that he had been one of those who had talked in "very round enthusiastic language" on the subject, and stated: "My study of this matter has convinced me that we have talked a little bit wildly of what can be immediately achieved by the development of electrical schemes." This view was confirmed by Colonel Moore Brabazon, the Parliamentary Secretary to the Ministry of Transport, who issued a timely warning against exaggeration in connection with "what electricity could do for the people." I am glad to think that at last, owing to our efforts, some idea of the truth is beginning to dawn upon them.

Happily we have a sane Government in office; and—as one would expect—during the debate on this question last Thursday, both the Minister of Transport and his Parliamentary Secretary refused to be hustled into giving a hasty verdict on so vital a question before they had time to study the whole subject.

The Electricity Proposals.

To gain a clear perspective, I must once again refresh your memories by referring to the only definite proposals which have hitherto been put forward—viz., those propounded by Mr. Snowden, the late Chancellor of the Exchequer, last year. He, you will recollect, proposed to grant subsidies out of the National Exchequer for the development of electricity in this country, first, in order to establish a uniform frequency, in which connection he mentioned a figure of ten million sterling; secondly, for the purpose of the laying of main transmission lines in cases where the undertakers had no intention in the near future of laying such lines with their own resources—in other words, where the laying of such lines would be an uneconomic proposition; thirdly, for the development of electricity in rural areas, including the electric lighting of cottages and the so-called general improvement of the amenities of country life.

It is interesting to note that Mr. Snowden admitted last week that his ultimate aim and object was to achieve the nationalization of the electricity supply industry. He stated:

> "My confidence is such that I would not hesitate even to spend public money in improving the undertakings which are still in the hands of private companies, knowing full well that the time will very quickly come when we shall buy out those private companies, and then what assistance they have received from the State will be taken into consideration in estimating the price."

I can hardly believe that a Conservative Government will take any steps which will pave the way for that ultimate nationalization which Mr. Snowden is so eagerly anticipating.

Reverting to the actual proposals which have been put forward, I must confess that I was surprised to find that visionaries are still to be found who regard the extension of electricity supply to rural districts as an economic and paying proposition, a proposition that will help the electricity industry to sell its commodity cheaply. So fantastic and fallacious are many of the statements in this connection, that it is difficult to know where to commence in refuting them. I do not think, however, I can do better than quote from the speech made by the Chairman at this year's general meeting of the Yorkshire Electric Power Company:

"Much has been said lately as to the use of electricity for agricultural purposes. It is, to my thinking, a beautiful dream of enthusiasts who have given very little thought to the revenue the farmer is willing to pay, as he now gets the power he requires from a small oil engine run for a very few hours a day.

"The principal obstacle in the way is the cost of distribution. To make a connection to a high-pressure electric main involves an expenditure of at least £200, although the amount of power required may be very small. Practically, it is found inadvisable to provide such a connection for less than, say, 50 H.P. The average farmer requires from 10 to 15 H.P.

"We are supplying between twenty and thirty farmers, and our results show that our average expenditure is £300 for each supply, and that the annual use is very small.

"In other countries special attention has been given to the possibility of supplying farmers with electricity, but it is found—as we find in this country—that the small amount of supply which the farmer requires stands in the way of a general extension of use.

"In Sweden, for example, it is found that the use made by farmers does not exceed 20 units per acre per annum, and the difficulty of providing the supply at a price which would be attractive to the farmer is the same as in this country.

"In Denmark supply is offered to farmers at a central transforming or sub-station. From these centres the farmers jointly bear the cost of the distributing mains, but their method of construction of overhead lines is such as would not be permitted in this country, and the drop in pressure in the long lines makes the lighting of little value when the main power supply is required.

"In France they are finding the same difficulty of a small use by the farmers. So much has been said about the use of electricity for agriculture that I thought these very few short facts would be rather interesting to the shareholders of the Company."

These are the words of the Chairman of an important electric power company, and most useful, in my judgment, for the whole country. I venture to commend them to the notice of Mr. Lloyd George, who has recently referred to what France and Denmark are doing with regard to electricity supply in rural areas. He even went so far as to give the views of an electrical expert, whom he quoted as saying that, in agriculture, electricity "would really double the produce." A careful search has failed to discover this statement, but in any event I do hope that Mr. Lloyd George and other Members of Parliament will not be carried away by these dreams and visions. It is extremely improbable that the farming community will avail themselves of electric current even when carried through rural areas, as they will find it is cheaper and more convenient to use an inexpensive and mobile internal combustion engine. To-day, those who farm on only a modest scale have their own motor tractors, and can—and do—utilize these on the farm for power purposes, such as grinding corn, chaff and root cutting.

So much for the blessings of electricity for those engaged in agriculture.

I now return to the other proposals—viz., the co-ordination of the type of supply, the interconnection of stations, and the laying of main transmission lines. These questions naturally hang together. It would be out of place at this meeting to discuss the technical aspects of the case, but I would like to refer to a statement recently made by the President of the Institution of Electrical Engineers, who pointed out that "the

carriage of coal from (say) South Wales to London, for the purpose of generating electricity at stations in London, is more economical than the establishment of generating stations in the coal-field and the transmission of electricity from the coal-field to the Metropolis."

Does it not therefore follow that the laying of great lengths of electric cable will increase, and not reduce, the cost of supplying electricity, and that money spent thereon will be money absolutely wasted, unless those cables are the means of providing a greatly increased demand, without which cheaper electricity is impossible?

You will have seen from the extract which I read to you that the electric power companies expect no assistance in this respect from the rural areas. I am therefore compelled to ask the all-important question—viz., Who is to find the money required to carry out this costly experiment?

If it is both sound and remunerative to adopt these proposals, why does not the electricity supply industry itself undertake the work? What ails electricity? Is the industry "depressed?" Far from it. Their financial resources are great. They have every facility for raising capital on highly favourable terms. If they have not the necessary legislative powers for joint working or amalgamation, Parliament can grant them; but the gas industry is entitled to—and does most emphatically—protest against any suggestion that State aid should be afforded to the electricity supply industry for "putting its own house in order." Any financial assistance from the Government, whether it takes the form of a guarantee or cheap money, or a direct grant, must of necessity react most seriously upon the gas industry, which to-day, in free and fair competition, can well hold its own against its rival.

In truth, the motive which underlies all these proposals is the desire to attain a high load factor in the *only* way in which it can ever be attained—and herein, to my mind, lies our greatest danger—by taking from us by means of State aid those domestic consumers we already serve. Electricity covets most of all the domestic load carried to-day by the gas industry. The Parliamentary Secretary to the Ministry of Transport himself, dealing last week with electricity, regretfully referred to the fact that "only 15 per cent. of the power generated in this country was used for domestic consumption." Be it always remembered that the domestic load is a fuel load—a load which in this country (as I have already indicated) is peculiarly and properly the province of the gas industry.

Again, what benefit would accrue to either the nation or the consumer if some State-aided scheme of electrical development were to enable electricity to be used in place of gas for fuel purposes? Benefit there would be none. On the contrary, the country would suffer irreparable loss. The employment of electricity for fuel purposes must always entail serious and unnecessary waste, and for this reason—that whereas 85 p.ct. of the total heat value of the coal is conserved when carbonized at the gas-works, the most efficient generating station utilizes only 20 p.ct., and wastes 80 p.ct. of the heat in the coal.

Such a policy would inevitably necessitate not only an enormous increase in the quantity of coal consumed, but—more serious still—the complete destruction of the numerous bye-products obtained from gas manufacture, indispensable alike in peace and war.

In conclusion, I contend that "robbing Peter to pay Paul" is not only inequitable, but is bad business, and I feel sure that no such policy would ever have been advocated in this country were it not for the fact that we are now passing through a period of unexampled trade depression. Statesmen are at their wits' end to devise schemes for remedying unemployment. Industrialists in many cases are disheartened and despondent. The community clutches at straws. At such a time it is more than ever essential that we should, every one of us, steady our nerves, maintain a true perspective, and, above all things, discourage panic legislation. I have no fear but that our industrial community will, if left to itself, achieve its own salvation in this respect. But I do most greatly dread and distrust any efforts of the Legislature to solve an industrial problem by Act of Parliament. [Applause.]

The Accounts.

Mr. William Cash, F.C.A. (a Vice-Chairman of the Central Executive Board) said he rose to second the resolution which had been moved by the President At the same time, and in the first instance, he would like to bear testimony to the very valuable, interesting, and instructive address by the President to which they had just listened. ["Hear, hear."] He thought that such an address as that, delivered on such an occasion as the present one, must afford the greatest encouragement to them all, and prove of the utmost help to them individually in dealing with the situation as it existed to-day. Turning to the report itself, they would find in it a record of very good work done during the past year; and as far as the attached accounts were concerned, they were set-out in such a form that the members could see for themselves what the receipts and expenditure for the year had been. He would merely draw their attention to two items. First, on the receipts side, they would see, under revenue, that the net receipts for the year were £16,436; whereas for the year to March, 1924, the amount was £13,930. Thus they had every reason to feel encouraged on this head. As regarded the expenditure side, there was one new item—£1000 granted to the Institution of Gas Engineers. Under "British Empire Exhibition" this year was included the cost on account of erecting a Tar Exhibit. The result of the year's working was a surplus of £27.

The Municipal Point of View.

Councillor James Stewart (Edinburgh) said that as a representative of a municipal undertaking, he had very great pleasure in associating himself with the remarks of the President and Mr. Cash. The gas industry, as they all knew, was one of the most important in the country, and was making progress against all competition. This was very largely due to the efforts of the National Gas Council, which since its inception had done a great deal to advance and popularize the use of gas. Without a Council such as that, each undertaking would have been "ploughing its own lonely furrow," without any great success. The report was very satisfactory, and showed good results, in which all the undertakings of the country equally shared. There was a good future for gas, and they knew that the efforts of the Council would greatly assist in its development. They fully recognized the benefits that were being derived from the efforts made by the Council to combat the proposals in regard to electricity.

The resolution was then put to the meeting and carried unanimously.

The President.

Sir Arthur Duckham, K.C.B., said it was his pleasure to propose the re-election of Mr. Milne Watson as President of the National Gas Council. Mr. Milne Watson had remarked earlier that they were not politicians in that room; but he (the speaker) would beg to say that they had a statesman as their leader. The whole of the gas industry looked to Mr. Milne Watson as its leader—a very worthy leader, a man who had done colossal work on behalf of them all, and to whom they looked for further work, and even more important work, as the times became more difficult.

Mr. Milne Watson had referred to this as being the first meeting of the National Gas Council held with the general Press present. He agreed with him, that they in the gas industry had really not "gassed" publicly enough about themselves. In the war he (Sir Arthur) had nothing whatever to do with the gas industry; but incidentally he controlled the electrical industry of this country. Think what the gas industry did for the nation during the war (it had been put on record very finely by the late Lord Moulton); the basis of explosives came from the gas industry; extraordinary efforts were made by the industry to supply the needs of manufacturers in regard to heat and power—and yet at the end of the war not one suitable reward was given to anyone in the industry, and no acknowledgment was made by the Government in any way of the services that had been rendered by the industry.

Gas as a Domestic Servant.

Further, he did not think people altogether realized that gas was the greatest servant of the public to-day. Its services exceeded those of any other public utility business. The whole of the domestic life of this country had been changed by gas; the lot of the housewife had been made in all ways easier. The gas industry was for the prevention of the smoke nuisance; and the improvement that had resulted to the air of the towns since gas had become a domestic servant was noticeable by everybody. Now one could see right across London on a Sunday morning; whereas, had it not been for gas, the domestic coal range would have been cooking the Sunday dinner—and the atmosphere would have been heavy. Then there was the call for solid smokeless fuel; and in the future the gas industry must be the medium for meeting that. The bye-products from gas-works were also of vital national importance. He did not think that all this was fully realized by the public, who did not seem to appreciate that the gas industry was a magnificent and a growing one—enormously strong, very active, and keeping its house in order by research. Further, the public did not realize that the gas industry—outside municipal ownership—could not increase dividends unless the price of gas was reduced, and that probably it was the only public service that had its dividends dependent upon the price charged for its commodity.

The Electrical Position.

Mr. Milne Watson had dealt very fully and very ably with the electrical position; and he felt certain that his remarks would make a great impression on all who read them. It was to be hoped that they would find their way into the hands of members of Parliament and Cabinet Ministers who would have to deal with a subject which might land this country in a very great and possibly ill-considered expenditure. The gas industry wished to see a prosperous country, which would mean a prosperous gas industry; and as cheap electricity made for prosperity they could assure the electrical industry that it would have their support, and not criticism, in any scheme put forward to develop properly the electrical industry for the benefit of the country. But here was a scheme which, at this time of heavy taxation and national expenditure, envisaged a further large drain on the resources of the country to carry out something

which had not been proved. All that the gas industry asked was that due consideration should be given to any scheme, not only by the electrical enthusiasts—by those who had their bread and butter to earn by being connected with electricity—but by everyone who was concerned with the supply of energy. All the gas industry had to fear was hasty legislation—hasty action on the part of the Government. If the scheme was properly brought forward, and time given for constructive criticism, he was certain it could not go through in the form which, from various statements, one might surmise was now proposed. Look at the speeches that were delivered in the House of Commons—such as Mr. Lloyd George stating the other day that it was very much cheaper to transmit energy in the form of electricity over long transmission lines than to transport the coal, when it was an absolute and positive fact that it was not cheaper, except for short distances. Take another statement made by the Minister of Mines, that the only hope for the coal industry was low-temperature carbonization. When men who had spent their lives in the fuel industry saw statements like these, it naturally made them nervous, and anxious that prompt measures should be adopted to prevent hasty action being taken on such vital subjects.

CENTRAL CONTROL.

There was a final point in regard to this electricity scheme to which he would like to refer—namely, that, as far as one could see, it was entirely based on central control in London. He thought this would be the greatest piece of revolutionary socialistic legislation ever seriously proposed. Many of those present were in charge of works which produced energy; and he thought they would all shudder at the idea of their activities being controlled by a central board. This he considered would be the one thing that would damn the scheme as propounded for electricity generation in this country. It was a thing which would be unworkable, and which must lead to nationalization. He would keep them no longer. The meeting had started well; for he was certain they had all been tremendously impressed by the President's address. They would all return to their various parts of the country ready to fight for their industry, and for the good of the country as a whole. [Applause.]

THE BLIND LEADING THE BLIND.

Alderman F. S. PHILLIPS, J.P., of Salford (a Vice-Chairman of the Central Executive Board), said he esteemed it a very great pleasure to be allowed to second the proposal that Mr. Milne Watson be again elected President for the ensuing year. As a member of the National Gas Council, of the Federation of Gas Employers, and of the National Joint Industrial Council for the Gas Industry, he could not conceive that they could possibly have found a gentleman better fitted for the work. Mr. Milne Watson's patience, courtesy, time, and influence had been given to them unstintingly, and had secured what he regarded as the phenomenal success of the National Gas Council and the other organizations. It was gratifying to think he would serve them yet for another year, and it was to be hoped for further years to follow. Might he (the speaker), as an old municipal representative of some forty years' standing, refer to the question of electricity in a few words? He did not understand why the politicians had got hold of this question of electricity, and why they were pushing it for all they were worth, as though it were going to be a panacea for all the ills from which the country was suffering. It was an absolute mistake. It showed him, as he got older, that he must put less and less trust in politicians. [Laughter.] They did not seem to understand the things they were talking about; and this pushing of electricity at the present moment was simply a case of "the blind leading the blind."

CIVIC PRIDE.

A few days ago, Mr. Lloyd George, in a debate, referred to municipal authorities. Now, a long experience of municipal authorities enabled him (Alderman Phillips) to say there was such a thing as civic pride in the work they were doing; and he ventured to assert that the work of civic authorities did not stand second to the work of the House of Commons ["Hear, hear."], either now or in days gone by. The work of municipal authorities had been good, and it was still good; and it claimed the best thought of the best men in the district. But what did Mr. Lloyd George say of it? Mr. Lloyd George referred in this way to the vested interests of municipal authorities. Remember, these vested interests had been created by Parliament:

> "You can put a price upon every other vested interest—it is sometimes very heavy—but the price of human vanity is prohibitive; and if you have got a chairman and an engineer and a clerk, all engaged in the working of one sort of little business upon which they make reports every year, the reports appear in the Press, and it is their own particular child. Then when a Chancellor of the Exchequer and Minister of Transport propose to take their baby away from them, it is without price so far as they are concerned, and therefore they object very much."

What could Mr. Lloyd George be dreaming about? Municipal authorities and their powers were the creation of Parliament, of which Mr. Lloyd George was a member. He had taken his part in creating these powers. If they were earnestly administered, was it right to turn round and say that it was vanity? Of course, they objected to their "baby" being taken away from them. Did anybody mean to tell him (the speaker) that the men who were elected by the ratepayers of a particular district or town, and were administering affairs on behalf of the citizens, could not do it better than a central board which was unacquainted with these affairs? Was there any sense whatever in the suggestion? Vanity was one thing; proper civic pride was another, and a desirable, thing.

MILLIONS AT STAKE.

As he had said, he was surprised at the politicians pushing this electricity matter. He himself was a member of the Electricity Committee, by request of his Corporation, as well as Chairman of the Gas Committee. Electricity must have its functions. He did not object to this; but he did object if it was going to be subsidized to the detriment of gas. There was no reason in the proposal; it would turn out to be a delusion, and was going to cause a great waste of public money. The whole business led one to hope that politicians would keep to their own particular business—whatever that might be—and leave industry alone. What was going to be the upshot of it all? If they did by this means destroy the gas industry, created by Parliament, with its powers granted by Parliament, what would be the position? So far as municipalities were concerned—and he was speaking for the moment particularly of municipalities working on money borrowed under the powers granted them by Act of Parliament—with a capital of some £58,000,000 needing to be repaid, where would the towns be, if the gas industry were destroyed? He resented very strongly that statements such as one heard and read now about electricity should be made without sufficient information, and without adequate knowledge, and which would tend to create a worse state of things than now existed. It was not by such means that they were going to get away from bad trade and out of difficulty; it was by steady application, on business lines, to the problem, and not on these lines of fancy, which had no truth and no solidity behind them. He did not think the final form of generation of electricity had yet been reached; there were too many processes between the burning of the coal and the transmission of the current. Improved methods would come some day.

The resolution having been heartily carried,

The PRESIDENT said: Thank you very much. I really do think it is high time you had a change ["No, no."]; but if you are anxious to back the old horse, the old horse will do the best he can for another year.

OTHER OFFICERS.

Mr. J. FERGUSON BELL proposed the re-election of Alderman Sir William Kay, J.P., as Hon. Treasurer, and of Alderman H. Wade Deacon, C.B.E., J.P., and Alderman J. H. Lloyd, M.A., J.P., as Trustees. He said the Council were fortunate in having such gentlemen to guide their destinies. He was sure the members would like to send a message to Sir William Kay expressing their deep regret that for some little time past he should have been in ill-health, and the wish that he might have a speedy recovery. He had been a member of the Finance Committee, and had taken an active part in the work of the Council. Alderman Wade Deacon and Alderman Lloyd were very well known in the industry, and were strong supporters of the Council.

Mr. CHARLES WOOD (Bradford) seconded the motion, which was passed.

On the proposition of Mr. C. F. BOTLEY (Hastings), seconded by Alderman J. H. WADDINGTON (Mayor of Halifax), the re-election of the Joint Hon. Secretaries (Messrs. F. W. Goodenough and W. E. Price, Assoc.M.Inst.C.E.) and the Auditor (Mr. Alfred Morland, F.C.A.), was approved.

VOTES OF THANKS.

The PRESIDENT moved a hearty vote of thanks to the Chairmen and Secretaries of the District Executive Boards for their services during the past year. These Boards, he said, were essential to the efficient working of the Council. It was through them that it was possible to keep in touch with what was transpiring in the Provinces. It was very important that they should have the opinions of the districts. The positions of Chairman and Secretary involved a great deal of work; and a vote of thanks was a very small token of appreciation of their important functions.

Mr. FRANK H. JONES, seconding, said he realized that they had very efficient headquarters, and this efficiency must be very much enhanced by the work of the District Boards.

Mr. G. HARDY-HARRIS (Exeter) and Mr. SILLITOE (Manchester) acknowledged the vote—the former on behalf of the Chairmen, and the latter for the Secretaries.

The PRESIDENT next proposed a vote of thanks to the Finance Committee for their unremitting labours.

Mr. THOMAS GOULDEN seconded this, and it was acknowledged by Mr. CASH, who referred to the excellent work of the staff.

The PRESIDENT, proposing a vote of thanks to the staff (which

was cordially agreed to), said he thought none of the many organizations with which he was connected had a better staff than the National Gas Council. Mr. Fottrell, Mr. Ogilvie, Mr. Smith, and those who worked under them, were all first class, and were devoted to the Council's interests. They were blessed with discrimination and great intelligence; and all who came in contact with them would agree that they deserved this vote.

Alderman Sir Albert Ball, J.P., moved a vote of thanks to the President for his able address, and for the way in which he had conducted the proceedings at that meeting. They realized, he said, that in Mr. Milne Watson they had the first man in the industry to-day—one who was exceptionally tactful, full of determination, and always ready to do everything humanly possible for the gas industry. It was the sincere wish of every member of that Council that the President might be spared for many years to lead them, to give them the benefit of his advice and help; and with such service as this, he was satisfied that the gas industry would prosper for generations to come.

Mr. Ferguson Bell seconded, with the remark that it required no words from him to commend this resolution to the hearty approval of the members. They were all aware of the great services of Mr. Milne Watson in respect of the Council. They were pleased to have him at their head; and they hoped to have him so for many years to come.

The President thanked the members, and added that it was a pleasure to preside over such an enthusiastic and determined gathering as they had had that day.

INSTITUTION OF GAS ENGINEERS.

Annual Report of the Council.

The following are the main portions of the report of the Council of the Institution of Gas Engineers for the year 1924-25, which will be submitted at the annual general meeting of the Institution, to be held in the Great Hall of the Institution of Civil Engineers, Great George Street, Westminster, S.W., on Tuesday, Wednesday, and Thursday, June 9, 10, and 11, under the Presidency of Mr. J. Ferguson Bell, M.Inst.C.E., Chief Engineer and General Manager to the Derby Gas Light and Coke Company.

Details of the programme for the meeting will be found on p 59 of the "Journal" dated April 1.

Membership.

Owing to the increasing number of applications for admission to the Institution, it was necessary to issue two balloting lists for the election of new members during the year.

The figures show that the net increase in membership was 55. The total number of members on the register at the end of that period was 1057. With the fifty candidates for election at the annual meeting, the total number on the register will be brought up to over 1100.

Class of Membership.	At Dec. 31, 1923.	Elected and Transferred in 1924.	Deceased, Resigned, and Transferred in 1924.	At Dec. 31, 1924.	Increase or Decrease.
Hon. members	24	..	3	21	− 3
Members	799	49	21	827	28
Associate members	126	43	9	160	34
Associates	11	1	1	11	..
Students	42	14	18	38	− 4
Total	1002	107	52	1057	55

The Council refer with gratification to the gracious consent of the Prince of Wales which enabled them to elect His Royal Highness an honorary life member of the Institution.

Since the last report was issued, the following have been transferred from the class of Associate Member to Member; and have been admitted as Students.

Transferred to the Class of Member.

Walter A. Barnett	Barnet.
Harry Curtis	Macclesfield.
Herbert C. Higgs	Basingstoke.
A. Graham Lane	Aylesbury.
David Muir	Pontypridd.
George W. Richmond	Beckton.
George Walmsley	Londonderry.

Admitted as Students.

Edward Morgan Edwards	Neath.
Alexander S. Grime	Brentford.
Ralph Halkett, jun.	Sheffield.
Terence H. Madden	Cardiff.
Alan H. Nicholson	Stockton-on-Tees.
Wilfrid Richard Quiller	Plymouth.
John Roberts	Bingley.
Albert E. Simpson	Nottingham.
Alexander G. Skinner	Redhill.
Reginald F. Thomson	Nottingham.
Benjamin Thorpe	Longwood.
John H. Wainwright	Tipton.
John E. Wakeford	Stockton-on-Tees.

Deceases.

The Council have to record, with regret, the deaths of the following members:

Sir George Beilby, F.R.S.	London.
Augustus F. Browne	London.
Charles C. Cawthra	Halifax.
Thomas Crossley	Guernsey.
P. B. Ellacott	Waterford.
Charles Franks	London.
Harry E. Jones	London.
John Lewis	Newcastle-on-Tyne.
Walter A. Sapey	Tamworth.
Stephen Temblett	Andover.
Thomas Watson	Rushden.
James Whimster	Armagh.

Of these, Sir George Beilby was an honorary member, and Mr. H. E. Jones a Past-President. Both of them rendered exceptional service in promoting the interests of the gas industry during a long life, particularly during the period of the war.

National Gas Council.

The representatives of the Institution on the Central Executive Board of the National Gas Council during the year 1924-25 have been Messrs. J. Ferguson Bell, Charles F. Botley, Samuel Tagg, J.P., and Thomas Goulden.

Affiliated District Associations.

The seven affiliated District Associations have been represented on the Council of the Institution during the same period as follows:

Eastern Counties Association	Mr. Edward F. Keable.
Manchester District Institution	Mr. Harold Davies.
Midland Association	Mr. William E. Caton.
North British Association	Mr. James Campbell.
North of England Association	Mr. Samuel Shadbolt.
Southern Association	Mr. Leonard J. Langford
Wales and Monmouthshire Institution	Mr. W. Clark Jackson.

Annual General Meeting.

The sixty-first annual General Meeting was held in the house of the Institution of Electrical Engineers, Victoria Embankment, on Tuesday, Wednesday, and Thursday, June 24, 25, and 26, 1924, under the Presidency of Mr. Samuel Tagg, Engineer and Manager of the Preston Gas Company. Particulars are included in the report.

British Engineering Standards Association.

The representatives of the Institution on various Committees of the British Engineering Standards Association consist of Messrs. J. G. Clark, Thomas Hardie, Alex. A. Johnston, and Albert Stokes.

With reference to the Sub-Committee on the Standardization of Gas-Valve Flanges, on which Mr. Hardie represents the Institution, agreement has been reached by the Sub-Committee of the Association and the Joint Committee of the Institution and the Society of British Gas Industries. The following table gives the dimensions which have been approved by the Sub-Committee.

For Working Pressures up to 30 Lbs. per sq. in. for Gas and 50 Lbs. per sq. in. for Water.

Bore.	Diameter of Flange.	Diameter of Bolt Circle.	Bolts.		Thickness.
			No.	Diameter. In.	
In.	In.	In.			In.
2	6	4½	4	⅝	⅝
2½	6½	5	4	⅝	11/16
3	7½	5¾	4	⅝	11/16
3½	8	6½	4	⅝	¾
4	8½	7	4	⅝	¾
5	10	8½	4	⅝	¾
6	11	9¾	4	⅝	13/16
7	12	10¾	8	⅝	13/16
8	13½	11¾	8	⅝	⅞
9	14½	12¾	8	⅝	⅞
10	16	14	8	¾	15/16
12	18	16	8	¾	15/16
14	20½	18½	8	⅞	1
15	21½	19½	8	⅞	1
16	22½	20½	12	⅞	1 1/16
18	25½	23	12	⅞	1 1/16
20	27½	25½	12	⅞	1⅛
21	29	26½	12	⅞	1⅛
22	30	27½	12	1	1 1/16
24	32½	29½	12	1	1 1/16
26	33½	30½	16	1	1¼
27	34½	31½	16	1	1¼
28	35½	32½	20	1	1¼
30	37½	34½	20	1	1¼
32	39½	37	20	1	1¼
33	40½	38	20	1	1¼
36	43½	41	24	1	1⅜
38	45½	43	24	1	1⅜
40	47½	45	24	1	1⅜
42	49½	47	28	1	1⅜
45	52½	50½	28	1	1⅜
48	55½	53½	28	1	1⅜

The work of the respective Sub-Committees on Portable Photometers, Illumination Materials, and Fittings is being proceeded with, and will be reported upon when ready.

With reference to Sub-Committee 39/3, Standardization of the Methods of Testing and Specifying the Characteristics of Illumination Glassware and Translucent Materials of Sectional Illumination Committee 39/-, Mr. Stokes reports that satisfactory progress had been made by this Committee. A provisional draft of specification has been drawn up by the Sub-Committee dealing with the matters of quality, finish, dimensions, diffusing power, brightness, and efficiency of translucent glassware. Alternative methods of measurement—viz., the "flux" method and the "point-to-point" method—are recommended for adoption.

The following summary of the work carried out during the past year by the three Committees of the British Engineering Standards Association on which Mr. A. A. Johnston, of Brentford, represents the Institution, has been supplied by him:

(*a*) Sectional Committee on Machine Parts, their gauging and nomenclature.
(*b*) Sectional Committee on Pipe Threads.
(*c*) Sub-Committee on Steel Tubes.

With regard to Sectional Committee 10/- on Machine Parts, although no meetings were held during the past year a number of reports of its Sub-Committees were submitted to it by correspondence—namely: No. 164-1924, Limits and Fits for Engineering; No. 190-1924, Dimensions for B.S.W. Bright Hexagon Bolts, Set Screws and Nuts, Split Pins, Washers, and Studs; No. 191-1924, Dimensions for B.S.F. Bright Hexagon Bolts, Set-Screws and Nuts, Split Pins, Washers and Studs; No. 192-1924, Dimensions of Spanners.

No. 164 represents a satisfactory termination of a work which was full of difficulty, and should be of value in every department of mechanical engineering where interchangeability is required.

Nos. 190 and 191 should also prove a benefit to industry, as they represent the result of an agreement with the bright bolt manufacturers, by which the latter have undertaken to keep in stock the sizes shown in these reports.

Furthermore, the revision of the Tables on Black Bolts and Nuts is being undertaken, and a report on the lines of that for Bright Bolts and Nuts will, most probably, be submitted to the Sectional Committee in the near future; and the preparation of standards for cup-headed and countersunk black bolts for use in wagon construction, which has been asked for by the Railway Clearing House, will also be submitted.

No meetings were held by the Sectional Committee on Pipe Threads during the past year. Similarly in the case of the Sub-Committee on Steel Tubes, no progress has been made, owing to difficulties which have arisen in regard to the thicknesses and pressures coming under the designation gas, water, and steam.

International Commission on Illumination.

The sixth session of the International Commission on Illumination was held at Geneva from July 21 to 25, 1924. Mr. Robert Watson, of Doncaster, and Mr. Walter T. Dunn, Secretary of the Institution (owing to the unavoidable absence of Mr. W. J. A. Butterfield), attended as delegates; and their report will be presented at the annual meeting.

National Illumination Committee of Great Britain.

The Institution is represented on this Committee by Mr. W. J. A. Butterfield, Mr. J. G. Clark, Dr. H. G. Colman, Mr. F. W. Goodenough, and Mr. Robert Watson. The report of the Chairman (Col. Kenelm-Edgcumbe) for the year 1924 shows that important work is being carried out under the auspices of the Committee.

Wrought-Iron Tubing Committee.

This Committee consists of Mr. Albert Stokes as Chairman, Messrs. J. Ferguson Bell, J. E. Blundell, Fred Davies, Stephen Lacey, W. E. Price, Samuel Tagg, Frank P. Tarratt, and R. Hy. Ruthven as Hon. Secretary. Several meetings have been held, and the assistance of Mr. F. W. Harbord, F.I.C., Assoc.R.S.M., Consulting Metallurgist, has been obtained. The report of the Committee, together with draft of proposed specification which they recommend for adoption, will be communicated to the Institution at the annual meeting.

Institution of Civil Engineers Heat Engine and Boiler Trials Tabulation Committee.

This Committee has continued its work during the year. Several meetings of representatives of the co-operating bodies have been held. These bodies consist of the Institutions of Mechanical and Electrical Engineers, Naval Architects, Marine Engineers, North-East Coast Institution of Engineers and Shipbuilders, Institution of Engineers and Shipbuilders in Scotland, Institute of Chemistry, Institution of Gas Engineers, British Electrical and Allied Manufacturers' Association, British Engineers' Association, the Admiralty, the War Office, and the Air Ministry. The Institution's representatives on the Committee are Mr. W. Newton Booth, B.Sc., Mr. Walter Chaney, Mr. Harold Hollings, M.Sc. (taking the place of Mr. Stephen Lacey, B.Sc., who resigned), and Mr. E. W. L. Nicol.

Birmingham Medal.

The Council report with much gratification that the members of the Institution have unanimously endorsed their recommendation that the Birmingham Medal should be awarded in 1925 to Dr. Charles Carpenter, C.B.E., M.Inst.C.E. Arrangements have accordingly been made for its presentation at the annual meeting.

Shipping Engineering and Machinery Exhibition.

The Council have accepted an invitation for the Institution to be represented on the Committee of the Shipping Engineering and Machinery Exhibition which is to be held at Olympia from Nov. 23 to Dec. 5, 1925. Mr. Charles F. Botley, M.Inst.C.E., has been appointed to act in that capacity.

Public Works, Roads, and Transport Congress and Exhibition.

The Institution continues to be represented on the Permanent Organizing Committee of this Congress by its President and Secretary. The next congress is to be held at the Agricultural Hall, London, in November, 1925. One session is to be devoted to gas engineering, under the auspices of the Institution. A paper will then be read by Mr. C. S. Shapley, of Leeds, on "Public Lighting by Gas with Special Reference to Automatic Systems;" and another on "The Rating of Gas Undertakings," by Mr. George Evetts, of Westminster. Discussions will follow.

Royal Sanitary Institute.

Mr. R. E. Gibson and Mr. H. E. Stone represented the Institution at the congress of the Royal Sanitary Institute which was held at Liverpool from July 14 to 19, 1924.

Smoke Abatement League of Great Britain.

Recognizing the valuable work which is being accomplished by the Smoke Abatement League of Great Britain, the Council have made arrangements for the Institution to become an affiliated member of the League.

Education Scheme.

The report of the Advisory Committee on Education will be presented at the annual meeting. It indicates that satisfactory progress is being made in this important department of the Institution's work.

Refractories.

During the year the Joint Committee of the Institution and the Society of British Gas Industries has had the Standard Specification under revision. Amendments and additions are being completed for insertion in it. The Committee's report for presentation at the annual meeting of the Institution is now in course of preparation.

Mr. A. E. Broadberry having resigned from the Committee, of which he was the Chairman, Mr. J. P. Leather has been appointed in his place. The Council wish to record their sense of high appreciation of the valuable services rendered by Mr. Broadberry in assisting the work of the Committee during the period of his connection with it.

Gas Investigation Committee.

The work of this Committee and of its Research Sub-Committee has been continued partly in a laboratory provided by the Leeds Gas Department at the Meadow Lane Gas-Works, and partly on the new Corbet Woodall Experimental Gas Plant now attached to the Coal Gas and Fuel Industries Department at the University, Leeds.

The principal work in one branch, to which Mr. J. W. Wood has given his time, has been the continuation and development of those studies in the aeration of burners by injection which have already formed the subject matter of the Ninth and Eleventh Reports. The special subject of the year has been the investigation of lighting burners. In addition, careful work has been carried out in order to place the experimental determination of the specific gravity of gas on a better footing. The results obtained are embodied in the Thirteenth Report of the Committee.

Dr. Parker has been occupied in getting the Corbet Woodall Experimental Gas Plant into a proper condition for the carry-out of reliable work by its use and in the making of preliminary tests. It has been thought advisable to embody in the Fourteenth Report a complete description of the plant and its use, the constructions adopted, and difficulties encountered.

The Committee would like to acknowledge its indebtedness again to Mr. J. W. Wood and Dr. A. Parker, the Research Chemists in charge of the two branches of its work now reported upon, for the continuing zeal, ability, and initiative which they have brought to bear upon the work committed to them, with the valuable aid rendered by Mr. Howarth as assistant to Mr. Wood and by Mr. Kerr and Dr. Monkhouse as assistants to Dr. Parker. The opportunity is also taken of thanking Mr. C. S. Shapley and the Leeds Corporation Gas Department for the greatly appreciated facilities which they have continued to provide at the Meadow Lane Gas-Works.

Advisory Committee on the Livesey Professorship.

An arrangement was made this year by which this Committee and the Gas Investigation Committee were summoned for the same day, May 21, 1925, to meetings at Leeds, in order that members of the two Committees should meet one another

and have opportunities for inspecting the work of the Department both in research and teaching.

Prof. Cobb reported that research work had been active during the year, and that one addition had been made to the staff in the person of Mr. Geoffrey Claxton, M.Sc., who has been appointed to assist Mr. J. H. Hoffert, Chief Research Chemist of the Joint Benzole Research Committee of the University and the National Benzole Association. Research publications of the Department during the year include the reports of the Gas Investigation Committee (see above), of the Benzole Research Committee on the use of active carbon and silica gel for benzole recovery, and publications on the subjects of refractory materials and metallurgy.

As regards teaching, the normal day courses have been given, while the special evening lectures were given by Mr. Stephen Lacey, on the "Principles of Gas Distribution," Mr. C. F. Finn, on "Coke Oven Practice," and others. Students have assisted during test periods on the Corbet Woodall Experimental Plant.

Institution Gas Research Fellowship.

This appointment was resigned by Dr. Pexton on his appointment to the research staff of the Gas Light and Coke Company, and he has been succeeded by Mr. C. B. Marson (B.Sc., 1st Class Honours, Fuel and Metallurgy). During the past year Mr. Marson has been engaged upon the study of the influence exerted by the incombustible mineral matter of coal on the processes of carbonization and gasification with special reference to nitrogen and sulphur. The results obtained will be reported to the Institution at the annual meeting in the form of a joint paper by Mr. Marson and Prof. Cobb.

Corbet Woodall Scholarship.

Mr. A. G. Grant continues to hold this scholarship, and will be going up for his final pass Degree Examination for the B.Sc. in Gas Engineering in June. When the Pass Course is completed, Mr. Grant proposes to stay for a fourth year at the University, in order to undertake some research under supervision and present a thesis upon it for the Honours Degree.

Appointments Register.

The Council have instituted a register for the benefit of those members of the Institution who may be out of employment. The District Associations have been informed of the arrangement, and the ready manner in which they have promised to co-operate in the matter is much appreciated. Any members in a position to advise the Secretary of vacancies which are likely to arise are asked to send particulars to the office as soon as possible.

Library.

The donations to the library which have been received during the year are enumerated in an appendix. The Council gladly avail themselves of this opportunity of acknowledging the indebtedness of the Institution to those who have kindly presented them. The preparation of a new edition of the library catalogue is now in hand.

Accounts.

There is also appended a copy of the accounts for the year ended Dec. 31, 1924, duly certified by the Auditors (Mr. Sydney Y. Shoubridge and Messrs. Wood, Drew, & Co.).

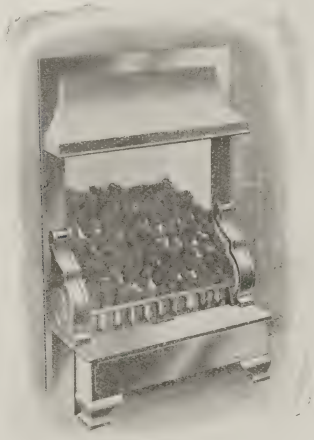
J. Ferguson Bell, *President*
Walter T. Dunn, *Secretary*.

May 22, 1925.

"SENTRY" GAS FIRES.

Readers of the "Journal" will be interested to learn that the manufacturers and patentees of the "Sentry" hot water boilers (Messrs. Wood, Russell & Co., of Nos. 34 and 36, Oxford Street, London, W. 1) have turned their attention to the production of a gas fire which has many attractive features, and of which three types—inset, self-contained, and dog grate—have been placed on the market.

The "Sentry" inset fire should make a ready appeal to those who now have coal grates fitted in their houses, and are potential users of a gas fire embodying in a large degree the charm of the traditional coal grate, and who are at last realizing the enormous amount of labour, dirt, and dust created by burning coal. Great care has been taken to give the fire true architectural expression; and every consideration has been given to designing an efficient, hygienic, and silent burning fire which appears to be a component part of the existing grate.



"Sentry" Inset Fire.

The same fire unit in all its sizes is used for the "self-contained" type; the frame and canopy being designed in the decorative style of the William and Mary period, which lends a graceful and dignified effect. The frame projects only 1¼ in. from the face of the surround. Thus the self-contained fire has the appearance of a built-in model, and is easily fixed by a fitter, without the assistance of other skilled tradesmen. The canopy contains an ample hood for the removal of the products of combustion, and at the same time affords efficient ventilation of the apartment.

The dog grate is made in the 18-in. size, and is fitted with an iron fireback of the "Sussex" type. It is designed expressly to fit into existing tile and brick recesses where the other types of fire would not be suitable.

"Sentry" Self-Contained Fire.

An important feature of the whole series of "Sentry" fires is that the measurement representing the size of fire is the actual width across the radiants. Thus, a 14-in. fire fits the ordinary 14-in. coal grate and is actually 14 in. across the radiants; there being no unnecessary thickness of the firebrick cheeks to give apparent increased width.

A unique feature of the "Sentry" is the introduction of a radiant combining the advantages of the vertical radiant with the charm of the loose black fuel. While an inclined pattern of fire can obviously be made more nearly to resemble a coal fire, this has hitherto been effected at the expense of direct radiant heat. In the "Sentry" fire, however, the lower and vertical portion of the radiant is unobstructed, and direct radiation is assisted by a highly-polished trivet and fuel bar.

Messrs. Wood, Russell & Co. have recently opened extensive showrooms at the address given above, where the new series of "Sentry" fires are displayed in attractive mantel settings. The decoration and reconstruction of the showrooms has been designed by Major F. Cornelius Wheeler, who was Manager of the Nautilus Fire Company before going into partnership with Messrs. Wood, Russell & Co. All interested in the recent developments in coke and gas apparatus should make a point of visiting the showrooms.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Auxiliary Section Meeting.

The Twelfth Half-Yearly Auxiliary Meeting of the Association was held on Saturday, May 23, in the chemistry laboratory of the Armstrong College, Newcastle. Dr. GEOFFREY WEYMAN, Chief Chemist to the Newcastle and Gateshead Gas Company, presided over a good attendance.

The Chairman, in opening the proceedings, thanked the members for the honour they had done him in electing him Chairman for the current year.

ADDRESS.

By Dr. GEOFFREY WEYMAN.

While the saying that "it is a poor workman who blames his tools" often contains a good deal of truth, yet it is wise periodically to examine our tools to see if they are really capable of doing their proper part. The tools of the gas technician consist of plants of very varied types, and have to deal with a large variety of materials, including solids, liquids, and gases. In making a hurried review of these tools, I am taking up the attitude of the lazy workman who is finding all the faults he has heard of in the particular implement he is supposed to be wielding, not so much as regards the strength or endurance of his tool as in the efficiency with which he can use it.

Far too much of the plant seen in operation is a more or less confused tangle of pipework, tanks, and units of various types. Many of the chief means of control are in almost inaccessible places. The operators are unnecessarily large in number, and have to exert themselves physically to an unjustifiable extent. Those in charge realize only too well what it means to work a badly-designed and ill-arranged plant; and it behoves us to consider seriously how this defect can be avoided. Most plants are now largely designed and erected by firms who make the different units. These plant makers are naturally anxious to standardize their products as far as possible, and are chary of accommodating their designs to suit local conditions. But, to give the best results, plants must be adapted to local conditions; for it is a fact that identical plants may give varying results in different situations, not only so far as general economy goes, but even in regard to efficiency. Plant makers must necessarily obtain their experience of large-scale working at the user's expense; and, when once a plant has been evolved and placed on the market, they too often lose touch with the small details which contribute so much to successful results. The only party really in a position to appreciate the problem and formulate an economical plant is the user himself. The guarantees so often insisted upon are after all only a paper safeguard. A penalty may be enforced for some loss of efficiency, but no plant maker can or will give any assurance against uneconomical working. It is, of course, the economy which counts—the relation of costs to value of output—and as often as not it pays to sacrifice efficiency in some direction for the sake of economy. The plant user has, in fact, to face the responsibility in any case, and must decide for himself which type of plant will work best under his particular local conditions.

In recent years the education and training of technical staffs both in the gas and other industries has so greatly improved, that there is no adequate reason why the design and arrangement of all plant should not be systematically considered, and the plant makers given the necessary plans and specifications enable them to put forward a product suitable in design and convenient in arrangement for each particular set of conditions.

To plan successfully requires imagination. The faculty of greatest importance is that of visualization; the power of forming mental pictures, not only to "see through a brick wall," or more commonly an iron plate, and to picture the other side, but also to form moving pictures in which the various parts of the plant or apparatus are actually functioning as in practice. Many plants would certainly not be in existence to-day if the designers had only visualized them in operation, had realized the effect on the plant when it was overloaded or underloaded, and had seen the operators working under adverse conditions. The final drawings of any proposed plant should most certainly emphasize the position of the controls and the sphere of each workman to be engaged.

An important point to be considered is the amount of capital justified. The expenditure of either too much or too little capital places a severe handicap on the plant. This expenditure will depend on the capacity of the plant, on the system of operation, and on local circumstances. A portion will be devoted to labour-saving arrangements, and another portion to plant for saving materials, including steam and water. The expenditure in each of these directions must be considered if the real economical limit is to be fixed. It is necessary that the capacity of the plant shall have a close relation to that normally required. With a given plant the labour costs, repair and maintenance, and capital charges tend to remain the same whatever the output may be. Even the material charges are sometimes heavier for an under-worked plant. In gas-works most of the plant is subject to a variable load, and this is a great handicap. In many cases variations can be overcome by storage accommodation, and if plant of the continuous type—for example, sulphate plant—is worked only at intervals. The trouble of course is that labour is difficult to absorb in the "off" periods, and the capital and a portion of the repair and maintenance charges are running-on while the plant is standing idle. An alternative is to use smaller plant units, in which case the capital cost per unit of production will be higher and the labour costs also increased. Apart from other considerations, some units of plant—for example, heat interchangers—cannot be worked efficiently at much higher or lower than a definite capacity. Other types do not suffer to any great extent, and a compromise is often advisable, in which certain units are installed of high capacity and worked intermittently, while the rest are worked continuously on a smaller but definite load.

Another consideration is the effect of working losses of materials; and for this reason it may be best to keep the capacity on the high side and use the units less frequently. An example of this is the acid washer of a benzole-refining plant. A further consideration lies in the possibility of future increase in production. Unless the future increase is very definite, it is not advisable to risk incurring increased costs and capital outlay in designing a plant of such a capacity as to absorb this increase. A better plan is to compromise in the installation of large units in those instances where the efficiency is not interfered with, and to allow for duplication of units in other cases.

The system of operation may be either continuous or intermittent. The continuous system has the advantages of lower capital charges per unit of production per day, and lower depreciation charges. There is also less loss of material, and the wear and tear of the plant is smaller by reason of the elimination of the strain of starting and stopping. On the other hand, labour costs are at a higher level owing to the extra cost of shift work, and there is some loss of efficiency owing to poorer control on the night shift. Some operations do not lend themselves to continuous working—for example, rectification for pure products by distillation. In a general sense the continuous system is preferable for the production of crude products, especially if the concentration is low, and intermittent working for the last stages of refinement.

In regard to labour, one point might be emphasized; and that is, that, as replacement of men by mechanical appliances proceeds, the remainder have to be more skilled and more highly paid. The replacement becomes much less profitable as it proceeds; in other words, the capital needed to replace a workman increases very rapidly. The first step might cost about £1500; the second well over £2000.

As an example of local conditions affecting the design of plant, there might be instanced the need of some means of heating purifiers in exposed places on the North-East Coast, as compared with the absence of such necessity in sheltered positions in other parts of the country. A more important instance is the design of retorts situated on this coalfield as against that of plants placed in the Yorkshire coalfield. Distinction must also be drawn between units which are affected by exposure to the atmosphere and others which it is imperative to house.

The materials form a most important item in costs, often amounting to three-quarters of the whole; and considerable expenditure is justified to effect a reduction either by way of lowering the first cost of material or of increasing the efficiency with which materials are handled and used.

In considering plant for process work, it is useful to classify it according to the prime object in each case. There are three main classes—the preparation plant, reaction plant, and separation plant. A subsidiary class can be called "interconnection plant." In the preparation plant the materials are brought into the best physical condition—into a sufficiently concentrated form and under suitable degrees of temperature and pressure. The materials are then in a fit state for chemical reaction.

The reaction plant, which must necessarily be carefully controlled to give really economical working, can be made fairly simple if proper attention is given to the preparation plant. The products of reaction are then dealt with in the separation plant, which separates the various products, and refines or brings them to suitable physical state and concentration for the market. In many cases the separation plant follows on similar lines to the preparation plant, but is usually of a smaller capacity and more delicate in operation. It should certainly be at least as efficient, as it deals with the raw materials on which money has been spent and the value of which is approaching that of the final product. In a sense it is more important than the separation plant, because of the enormous difference in value which occurs in the last stages of refining.

The development of plant for process work largely consists in the extension of the preparation and separation plant, in order that the work of the reaction plant may be simplified and this part of the plant brought under better control. The first form of plant evolved is often a large and clumsy unit, in which materials are more or less mixed up to give contact, and the products roughly separated at the same time. As the process develops, additional units are specially designed and added to prepare the materials or separate the products while the reaction plant is reduced in size. As each unit now has a particular object, it can obviously be made more efficient.

Let us follow this line of thought for a moment, and see what it suggests in regard to gas-works plant.

Carbonizing Plant.—It is unfortunately the fact that the only preparation plant for coal in use on gas-works consists of a coal breaker to reduce the size of large pieces. So far as this is concerned, the important point is that no additional dust should be made, and it is preferable therefore to screen the small coal out, and only send the large to the breaker. So much depends on the treatment of coal prior to carbonization that it seems a pity that the screening, picking, and washing plants are all situated out of control of the gas-works. A point to which insufficient attention has been directed is towards securing uniformity of the chief raw material. There is no doubt that a considerable proportion of capital ought to be devoted to this object, as real economy cannot be secured in the retort house if the coal used is varying from retort to retort and from hour to hour. Again, in view of recent investigations, the inclusion of blending plant for properly mixing-in coke breeze or non-caking materials must be considered.

Reaction Plant.—The retort proper forms the reaction plant, and needs to be designed for the particular coals to be dealt with, and for the type of product resulting from it. We have no control over the coal once it is charged, except to a limited extent in continuous vertical retorts, so that practically everything hinges on the state of the coal prior to charging. It seems to me probable that the various differences in opinion which exist as regards the best size and shape of retorts to employ have arisen owing to the variation in coal used by the respective experts.

Separation Plant.—This consists of condensers, scrubbers, and purifiers. The condenser separates the tar and liquor from the gas, and incidentally withdraws heat from the gas. The question at once arises, How can this heat be utilized? In the days of intrinsic illuminating power the water-cooled condenser was not suitable, because the sudden chilling robbed the gas of a considerable proportion of its candle-power. To-day this condition is somewhat altered, as the reduction in calorific value by this means is not nearly so great. With the atmospheric cooler the heat cannot be recovered, but with the water-cooled condenser it can. The latter then becomes a heat-interchanger, and must be designed for that purpose. Usually the heat interchange is effected between the gas and boiler feed water, but it is a moot point whether the heat could not be more usefully employed at the purifiers—being transferred, either by a double interchange or by using the cold gas as the cooling medium in the condensers, before the purifiers.

Scrubbing Plant.—The scrubbing plant can be considered as a plant in itself—the scrubber or washer being the reaction unit; the condensers and tar extractors, the preparation plant, and the storage wells the separation plant. The object here is to produce a liquor of maximum strength and to recover all the ammonia. The essentials are low temperature, sufficient time contact, and a true counter-current system. Unless adequate condenser and tar extracting units are available, the scrubbers and washers will have to be greatly extended in size, because you cannot get proper contact when tar is present. In fact, as the scrubbing plant is reduced from sets of large tower scrubbers to the equally efficient but smaller and more delicate centrifugal washers, so the necessity arises for the more extended and efficient preparation plant, which takes shape in two directions—the purifying of the gas from tar, and of the water from substances which would be precipitated in the reaction vessel. It is, in fact, fatal to use water which has a high temporary hardness in a centrifugal washer if the gas also contains tar. So far as the separation plant is concerned, it is usually conspicuous by its absence, and in some cases cold liquor and hot tar are dumped in the same storage well under conditions which must obviously lead to loss of ammonia and bad separation.

Oxide Purification Plant.—This should be shown the same consideration. In order to reduce the size of the reaction plant—the purifiers—and also the amount of oxide used as a catalyst, it is necessary to use preparation plant for raising the temperature of the gas to that required for rapid reaction, and to bring the oxide used as a catalyst to a suitable physical and chemical state. In both these instances the ordinary gas-works plant can hardly be considered complete; and there would appear to be possibilities, which have not been sufficiently explored, of reducing the size of purifiers to at least one-hundredth of their present size. It is true that in many cases steam-heated coils are used in the boxes, but a little reflection will show the utter incapacity of such coils of reasonable size to influence the temperature of the huge volume of pas passed or the 100 tons or so of oxide enclosed in the metal box. Again, we are faced by the fact that no separation plant is used to concentrate or improve the quality of the spent oxide; and in view of the fact that materials such as pan-ashes of very low value can be economically concentrated, it should not be impossible to separate the mixture of oxide of iron and sulphur in an economic manner.

This short review will indicate the utility and suggestiveness of classifying plant, and how it is possible to arrive at an economic balance between the different portions of a plant.

Finally, there is one very important adjunct of plant which is still much neglected, and that is the means of control and the facilities for control. As development of plant takes place, so the operation becomes more intricate, and so the necessity arises for delicate means of control. If plant is to work with maximum economy, it is essential that we should know both when it reaches this desirable level and also the conditions under which this state of affairs is maintained. To obtain this knowledge, we must have means of measurement of both quality and quantity, besides the means of ascertaining such conditions as temperature and pressure. Really good facilities of control can only be given at the time when plant is designed and erected; and yet how often it is an after-thought! Moreover, the cost of such means, while usually insignificant, ought to be considered in relation to other costs, and reckoned and allowed for in the capital and running costs of the plant. It has always been a wonder to me that makers of plant should allow units which they are anxious should be an economic success to be installed

ARMSTRONG COLLEGE OF SCIENCE.

Art Department on left; Chemical Department on right; tower of new Union in the background.

HYDRAULIC LABORATORY—ENGINEERING DEPARTMENT.

ithout any means whatever of ensuring, by proper control, that ey are so.

There was no discussion.

Mr. L. M. Weldon (West Hartlepool) moved a vote of thanks Dr. Weyman for his address, which, he said, had been pre- ared on broad yet definite lines.

Mr. H. Greig (Sunderland) seconded, and remarked that the aper had given them something to think about. His subject as appropriate in view of the opposition which the gas indus- y had to meet from electricity concerns.

Inspection of Armstrong College.

At the conclusion of the meeting held in the main chemical cture theatre, the visitors proceeded to inspect the labora- ries of the Departments of Chemistry, Engineering, Metal- rgy, and Physics. Mr. Robinson guided the party round the hemical Department, showing first the research laboratory voted to work on the sugars—a particular study of Prof. aworth's. The chemical library is well situated between the boratory and the room in which apparatus mechanically erated is installed. A vacuum dessicator, Langmuir's mer- ry-pump, and a laboratory centrifuge were noted. Here the rty were greeted by the Principal of the College, Sir Theodore orrison. Accompanied by Prof. Haworth the party passed rough the laboratory devoted to organic chemistry and to the hnstone laboratory, a particularly fine and spacious room. A ll-equipped balance room and lecturers' laboratory were ited. It was explained that the laboratories for physical emistry were at present situated in temporary buildings outside the main building. The visitors were interested in a darkened laboratory where work on silver salts is proceeding under the direction of Dr. Briscoe. A particularly sensitive chemical balance was exhibited. A well-fitted glass-blowing room was seen in which all special glass apparatus is made as required. Prof. Haworth said how pleased he had been to welcome the party and to receive fresh proof of the interest in chemistry shown by the many branches of industry.

The party next passed on to the large engineering drawing office, and under the guidance of Mr. Martin were shown the various machines and testing appliances. It was explained that, owing to the installation of a new boiler house, it had become necessary to re-arrange most of the machines, grouping those using steam in a new building next to the boiler house, and replacing most of the other units. Among the numerous machines were noted a Diesel engine, a 100-ton Buckton testing machine, and a Martin-Avery testing machine. The large hydraulic laboratory equipped with different examples of turbines was much admired. The visitors passed on to the new boiler house, where three mechanically stoked Lancashire boilers supply the steam for heating the College buildings. These boilers, like all other plant, are suitably fitted so that the students may make all necessary tests and trials. There were also water-tube boilers in course of erection. In the steam engine section a variable multiple expansion engine and a recently-acquired experimental type of Parsons steam turbine were noted.

Passing on to the Metallurgical Department, the party were received by Dr. Smythe, who had arranged a demonstration

THE JOHNSTONE LABORATORY—CHEMICAL DEPARTMENT.

showing the preparation and etching of metal specimens for microscopic examination. The visitors—and particularly those concerned with the distribution side—were keenly interested in the specimens shown under the microscope illustrating the difference in structure between wrought iron and steel. Several members registered a resolution to develop the metallurgical examination of materials in their works. Owing to the time spent in this direction it was necessary to pass quickly over the other sections of the laboratories where coke-fired muffles and furnaces, for the reduction of ores and preparation of alloys, were grouped. The extension of the Department outside the main building could not be visited. The party were welcomed at the physical lecture theatre by Mr. Lunnon. Consideration for the visitors had led Prof. Stroud and his colleagues to believe that a demonstration of one or two experiments dealing with physical phenomena which have received application in the gas industry would be welcomed more than a cursory inspection of the Herschel laboratory and the range of research laboratories. Mr. Lunnon had therefore arranged in an excellent manner a few experiments which were viewed with marked interest by the members. One of these showed the great difference in the power of diffusion of coal gas and air. Another illustrated the marked difference in the viscosity of hydrogen and oxygen. In a third, coils of platinum wire were heated to the same degree by a similar current of electricity, and were immersed respectively in streams of coal gas and air, when the effects of the different conducting properties of the gases were clearly visible. The visitors were able to see the extreme sensitiveness of an instrument in which changes in the composition of gas causes a movement in the interference colours.

The party concluded the proceedings with tea served in the new Union building recently erected through the generosity of an anonymous donor.

The Chairman proposed a vote of thanks to the Principal of the College, to the Heads of the Departments visited, and to the guides who had shown them round. He said that some fifteen years ago, when he passed through the College, it was certainly the hardest working College in the country. From what they had seen he could believe that it was still so; but he was glad to find that two needs felt very much in his day—playing fields and adequate Union accommodation—had since been filled through the generosity of private individuals. The College had expanded in all directions; but it was tragic to find its work hindered by lack of finances. He felt it ought to be more supported by local industry; and since the gas industry was dependent on coal, he wondered if development might not take place in the direction of some department concerned primarily with the study of the constitution and peculiar properties of coal, for which all the sciences were needed. Their visit that afternoon had been of great use to them; and he felt justified in asking the members not only to support the vote of thanks, but to register a resolve to make the utmost use of the College.

Mr. Copland (Newcastle) seconded, and referred to the development and complexity of modern plant and machinery.

Dr. Smythe, on behalf of the College, thanked the members. The complexity of modern industrial plant had been referred to by Mr. Copland; and he could not see how it was possible for those taking part in industrial life to do without such a training as provided at the Armstrong College.

Petrol for Starting Gas-Engines.—According to the "Engineer," a recent issue of "Vulcan" contains a warning about the use of petrol in starting gas-engines. In the case under review the engine would not start with gas, so some petrol was poured into the air inlet silencer. The engine then started readily and began to race. Shutting the gas inlet valve was of no avail; and an accident was only averted by tearing the ignition wire from the plug. It was found that nearly 2 gallons of petrol had been poured into the silencer; and this provided a large supply of fuel uncontrolled by the governor. When petrol is used, it should only be sprayed into the cylinder in definite small quantities.

Gas to Melt Snow and Ice on Railroads.—An interesting, and perhaps novel, use of gas is recorded by the "Inter-colonial Gas Journal of Canada," which states that some of the steam railroads are using gas to take the place of snow shovellers in freight yards, to keep frogs and switches cleared of snow and ice after heavy storms. The Pennsylvania and Erie Railroads have adopted the gas method for some of their important New Jersey yards. A convenient gas main is tapped, and a line of hose conducts the gas to the switches, where specially designed burners are placed. The burners are clamped between the ties to both rails, and when lighted heat the rails to such a degree that the snow and ice in the area is melted. Each set of burners does as much work as four men could do in the old way. In the Waverley yards of the Pennsylvania Railroad at Newark there are 172 gas burners, which consume 4300 c.ft. of gas per hour. These are connected to the street main at New Jersey Railroad Avenue, Newark, by a pipeline 2000 ft. long. Similar burners are also used in the Trenton yard of the Pennsylvania Railway and in the Rutherford yard of the Erie Railway.

WALES & MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.

General Meeting at Porthcawl.

So enjoyable proved the meeting held by the Institution at Porthcawl barely two years ago, that it was again decided upon as the place of meeting for the gathering last week; and an attendance of some fifty members proved the wisdom of the choice. Mr. W. H. Johns, of Swansea (the President) was in the chair. In the morning a paper by Mr. H. D. Madden, of Cardiff, was read and fully discussed; and after lunch, a pleasant afternoon was spent in bright sunshine and the invigorating air of the popular South Wales watering place.

The meeting was held in the Council Chamber, and was opened by Mr. Davies (the Vice-Chairman of the Porthcawl Urban District Council), who heartily welcomed the members to the town. He expressed regret at the absence of the Chairman, who was in London.

Minutes of the Last Meeting.

The Hon. Secretary (Mr. Octavius Thomas, of Pentre) read the minutes of the last meeting, and they were confirmed.

The Institution Roll.

On the proposition of Mr. A. E. Davey (Aberdare), seconded by Mr. B. Grainger (Caerphilly), the following additions were made to the roll of the Institution:

Members.

Mr. James Allen Cunniffe, Superintendent, Morriston Gas Works, Swansea.

Mr. Thomas Watson Little, Manager, Gas-Works, Mitcheldean, Glos.

Students.

Mr. John Martin Randell, Swansea.

Mr. Colin Ronald Monroe, Cardiff.

An Honorary Member.

Mr. J. H. Canning (Newport) proposed the election of Mr. R. G. Clarry, M.P., as an honorary member of the Institution. He had a great many friends in the gas industry; and though he was now in Parliament, his interest in the industry was as great as ever.

Mr. H. D. Madden (Cardiff), in seconding, said Mr. Clarry had done much for their Institution, but he was doing even greater work for the whole industry in Parliament, by the Bill he was promoting to give powers to gas companies to provide electricity.

The President remarked that, as Mr. Clarry's successor at Swansea, he would like to support the proposal; and the meeting heartily endorsed it.

Annual Report.

The Hon. Secretary then read the twentieth annual report of the Council, which stated that during the year three members and two students had joined the Institution, and six members and one student had resigned, leaving the number at the end of the year at 72 members, 8 students, and 1 honorary member. The receipts for the year amounted to £79 15s. 6d., and the payments to £75 9s. 8d., leaving, with the balance brought forward from last year, the sum of £43 2s. 2d. in the Treasurer's hands, together with £100 of 2½ p.ct. Consols.

Arrangements are being made to start classes in Gas Engineering and Gas Supply at Cardiff and Swansea during the coming winter, which the Council hope will be taken advantage of.

Mr. E. Ablett (Swansea) proposed the adoption of the report and accounts, remarking that both were very satisfactory.

Mr. H. D. Hazell (Newport) seconded the motion, which was carried.

New Office Bearers.

The following were elected office-bearers for the ensuing year:

President.—Mr. H. D. Madden, of Cardiff.

Junior Vice-President.—Mr. A. T. Kyle, of Abergavenny.

New Members of Council.—Messrs. T. B. Pearson (Pontypool), A. E. Williams (Cardiff), and E. Petty (Hirwain).

Hon. Treasurer.—Mr. J. H. Canning, of Newport.

Hon. Secretary.—Mr. Octavius Thomas, of Pentre.

Hon. Auditors.—Messrs. J. H. Jones (Dowlais), and A. E. Davey (Aberdare).

The President, proposing the election to the chair of Mr. H. D. Madden, of Cardiff, remarked that it was not necessary for him to say much about that gentleman, because they all knew him well and realized that he had always put forward every effort in the best interests of the Institution, and in everything that he undertook on behalf of the industry. He had been their President on a former occasion, and they would be greatly honoured by his becoming so again. It was extremely gratifying to them and to all his many friends to find that he had also been nominated Junior Vice-President of the Institution of Gas Engineers.

Mr. Canning seconded; remarking that they esteemed Mr. Madden, not only for his pre-eminence in everything that per-

ined to his profession, but also for those personal qualities which had endeared him to all of them. Since he had been in hat district, he had done everything possible to help his colleagues, and had made friends everywhere.

Mr. MADDEN thanked the members very much for honouring him by asking him to accept the Presidency for a second ime during the comparatively few years that he had spent mong them.

Mr. H. BARKER (Llanelly) proposed Mr. A. T. Kyle's election s Vice-President; and Mr. W. CLARK JACKSON (Neath) econded—pointing out that Mr. Kyle had been with them a ong time, and had taken an active part in Council matters.

The PRESIDENT proposed Mr. Octavius Thomas's re-election s Hon. Secretary, saying he did not know what they would o if he found it impossible to continue in this and the other ffices he was so ably filling for the industry in that part of the ountry.

Mr. A. T. KYLE (Abergavenny) seconded the motion.

LETTER FROM THE PRESIDENT OF THE INSTITUTION OF GAS ENGINEERS.

The HON. SECRETARY then read the following letter, which ad been received from Mr. J. Ferguson Bell, the President of ie Institution of Gas Engineers:

I regret nearness of the annual meeting of the Institution of Gas Engineers prevents my accepting your very kind invitation to be present at a meeting of your Institution to be held at Porthcawl.

I am very pleased to observe that you propose to elect Mr. R. G. Clarry, M.P., an honorary member, in recognition of his valuable services rendered to your Institution. May I add that Mr. Clarry has given very valuable assistance in many ways to the gas industry?

In addition, I should like to take this opportunity to thank the Wales and Monmouthshire Institution for their support of the Institution of Gas Engineers' Benevolent Fund.

I look forward to the pleasure of seeing a good many of your members at the annual meeting of the Institution of Gas Engineers.

BENEVOLENT FUND OF THE INSTITUTION.

The HON. SECRETARY proposed that a contribution of five aineas should be made to the Benevolent Fund of the Institu- on of Gas Engineers; and he also appealed to those members ho did not do so to subscribe individually. There had been a ry sad case of one of their own members who died sud- nly; and fortunately he (Mr. Thomas) was able to get a sub- antial grant for the widow. More money was wanted; and hoped that members would see what they could do. Even ms of a few shillings would be gratefully received by the In- tution of Gas Engineers.

Mr. J. ROBB (Chepstow) seconded the proposal, and it was reed to.

RULE 2 AMENDED.

Mr. MADDEN moved that Rule 2 of the Institution be altered read:

"That the Institution shall consist of members, honorary members, and students. Members and honorary members shall consist of engineers, managers, assistant engineers or managers, and technical assistants, whose qualifications shall not be less than those involved by the possession of the Higher Certificate of the Institution of Gas Engineers in Gas Engineering or Gas Supply, and who are in the service of gas companies or local authorities. Students to be pupils under the training of Engineers of gas-works in the service of gas companies or local authorities."

pointed out that this meant the opening of the doors of the stitution to those men who could secure the Higher Certificate the Institution of Gas Engineers in either Gas Engineering Gas Supply. He thought the Council had made a right ve in this matter. As one who knew a little of the inside rking of the Education Scheme, he could say that for a hnical assistant to obtain the Higher Certificate was no easy ng. His qualifications must be good before he was allowed sit. The amended rule would be an encouragement to the nger members of the profession to do their best.

The HON. SECRETARY seconded, and pointed out that the pro- al would only apply to future members.

A MEMBER'S RETURN.

The PRESIDENT said they had with them one of their mem- s, Mr. William Collin, who had spent some time in Chili— Coquimbo and Talcahuano. They were all very pleased to e him with them once again.

GENERAL SALES PROPAGANDA.

Mr. MADDEN then read a paper on "General Sales Propa- nda," which, with a report of the discussion, will be pub- ied next week.

Before the meeting closed, a vote of thanks to the Chairman d members of the Porthcawl Urban District Council, for ir kindness in granting the Institution the use of the Coun- Chamber, was passed on the proposition of Mr. JACKSON, nded by Mr. BARKER.

cknowledgment was made by Mr. F. JAMES (the Chairman he Gas Committee).

he members then had lunch together in the Pier Hotel, r which Mr. Madden submitted the toast of "The Porthcawl Urban District Council," coupling with it the name of Mr. James, who responded. Councillor GRIFFIN proposed "The Wales and Monmouthshire District Institution of Gas Engineers and Managers," remarking upon the indebtedness of the Porthcawl gas undertaking to both the Institution and Mr. Thomas. The President, in his reply, emphasized the many advantages possessed by combined gas and electricity undertakings.

CHEMICAL ENGINEERING GROUP.

Annual General Meeting.

The Annual General Meeting of the Chemical Engineering Group of the Society of Chemical Industry was held at the Chemical Industry Club, Whitehall Court, London, on Friday, May 29, and was preceded by an informal dinner, at which Mr. W. J. U. Woolcock, C.B.E. (President of the Society of Chemical Industry), was entertained. Mr. C. S. Garland (Chairman of the Group) presided.

The report of the Committee of the Group, which was unanimously adopted, recorded that the year's work had been carried on with noteworthy success, and that even better results are anticipated in 1925. Membership has increased from 315 in 1922 to 408 in 1924.

It has been the policy of the Group to co-operate with the various sections of the Society of Chemical Industry, and with other scientific institutions, in the holding of joint meetings, in addition to its own meetings; and this policy is to be adhered to in the future. There were a number of joint meetings held in 1924 in London and the Provinces, all of which were well attended, and provoked interesting discussions. The relations between the Group and the parent Society continue to be most cordial, and the Group is working in close co-operation with the Institution of Chemical Engineers in matters affecting their joint interests. At the Conference of the Smoke Abatement League at Manchester, in November, 1924, the Group was officially represented.

Attention was given in the report to the World Power Conference, held at Wembley from June 30 to July 12 last year, the Chemistry and Physics Section of which was organized by the Group at the request of the Society of Chemical Industry, and under the *ægis* of the British Electrical and Allied Manufacturers' Association. It was stated also that the Gas and Fuel Section of the Conference, which was organized by the National Gas Council, developed from the initial work of the Group Committee.

Reporting Accidents with Gas.

The Pacific Coast Gas Association have been taking pains to investigate accidents occurring with gas. During the eight months beginning with last August, an account was kept of reports appearing in the Daily Press of accidents to the public with gas in all Pacific Coast States; and the Secretary, realizing that the haste with which newspapers prepare their copy often leads to inaccuracy, attempted to verify the statements appearing in the Press. A letter was written to the gas company upon whose district an accident had been recorded, requesting the results of any investigation that might have been made, in order that this could be compared with the newspaper statement. Out of 31 replies containing sufficient detail to permit of a definite conclusion being reached, the significant facts emerge that in only six of the cases was the accident reported with reasonable accuracy by the Press; and that in ten instances the report was entirely incorrect, and gas either had nothing whatever to do with the accident, or was merely an "accessory after the fact."

Refining of Crude Tar Oils.

Abstracting an article from the "Technische Blaetter," on the subject of the refining of crude tar oils, the "Bulletin of the Cleveland Scientific and Technical Institution" says that these oils, especially the high boiling-point fractions, have a tendency to darken in storage, which unfits them for many purposes. Purification with sulphuric acid, as is common practice in the petroleum industry, will not do in this case, neither will liquid sulphur dioxide, although aqueous sulphuric acid is employable. It has now been found that these oils—and particularly such of their fractions as boil at over 200° C.—can be purified or refined by treating with alkalies or alkaline media. For this purpose they are mixed with small quantities of solid alkalies; heated with return-condensation; and then distilled-off from the residue. This process loses very little oil, and uses only a small quantity of purifier—the greater part of which can be regenerated. The advantages as against the aqueous sulphuric acid method are that the process can be carried out in any kind of iron vessel, and that it is speedy. It is suitable for purifying neutral as well as acid oils, and also unseparated mixtures of same such as occur in tar distillation. The process is covered by a German patent.

ABERDEEN GAS-WORKS.

Official Inspection.

On Monday, May 25, an official inspection of the works of the Aberdeen Corporation Gas Department was made. To mark the occasion, an illustrated brochure, descriptive of the undertaking, was prepared, from which we take the following few extracts.

Historical.

The Aberdeen Gas Light Company came into being in the year 1824. During the first four years of the Company's life only oil gas was manufactured, and the price charged was from 50s. to 40s. per 1000 c.ft. In 1828, the Company dropped the use of oil, and commenced the manufacture of coal gas, when the price of gas immediately fell to 15s. per 1000 c.ft. The success of the original Company led, in the year 1844, to the formation of a competitor, the Aberdeen New Gas Light Company, who erected their works at Sandilands, on land which now forms part of the present gas-works. Gas at this time was charged at 9s. per 1000 c.ft. It was soon discovered that it would be expedient to amalgamate the two Companies; and this amalgamation took place in 1846, when the manufacturing operations were concentrated at the Sandilands site. In 1871 the Gas Company's undertaking was transferred by Act of Parliament to the Town Council of Aberdeen. Gas at this time was 5s. 5d. per 1000 c.ft.

The remarkable progress of the undertaking since the date of transfer may be seen from the following table:

Table Showing Progress of the Undertaking During the Last Fifty Years.

	Gas Made. C.Ft.	Gas Rental.	Residual Products.	Price per 1000 C.Ft.	
			£	s.	d.
1874	172,171,000	36,074	2,911	5	0
1884	286,770,000	47,590	7,986	3	10
1894	430,569,000	65,440	11,011	3	5
1904	649,049,000	93,974	21,090	3	0
1914	989,598,000	107,235	39,493	2	3
1924	1,440,715,000	166,131	87,026	2	6

The Sandilands site occupies an area of 9¼ acres, while the gas storage site, situated about half-a-mile distant, extends to 4½ acres.

The gas-works are about three-quarters of a mile from the Railway Station, but are connected by a railway with the various yards and the harbour—Corporation locomotives being employed to handle the traffic.

Carbonizing Plant.

The carbonizing plant now consists of 432 horizontal retorts arranged in beds of eight, and comprising four benches, operated by mechanical stokers, and two installations of Woodall-Duckham vertical retorts—the latter having a total carbonizing capacity of 292 tons of coal per 24 hours.

In 1899 and 1901, inclined retorts were erected by way of experiment. These retorts, 36 in number, were put out of action in 1923, to make way for the second installation of verticals. In 1908 a carburetted water gas plant was installed, comprising two sets of Merrifield-Westcott-Pearson type; each set being capable of producing 750,000 c.ft. of C.W.G. per diem.

In 1913 a contract was placed with the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., for a carbonizing plant of 100 tons capacity per day, consisting of twenty Woodall-Duckham vertical retorts built in settings of four. This plant has now been in operation for eleven years. It continued for eight years without being re-set, and then only partial re-setting was necessary. As the result of the success of this first plant, the Gas Committee and their Engineer and Manager, Mr. S. Milne, decided to scrap the inclined retorts, and to replace them with verticals. A contract was therefore placed, in June, 1923, for a further installation of Woodall-Duckham verticals having a capacity of 192 tons per 24 hours; and this plant was put to work at the end of November, 1924.

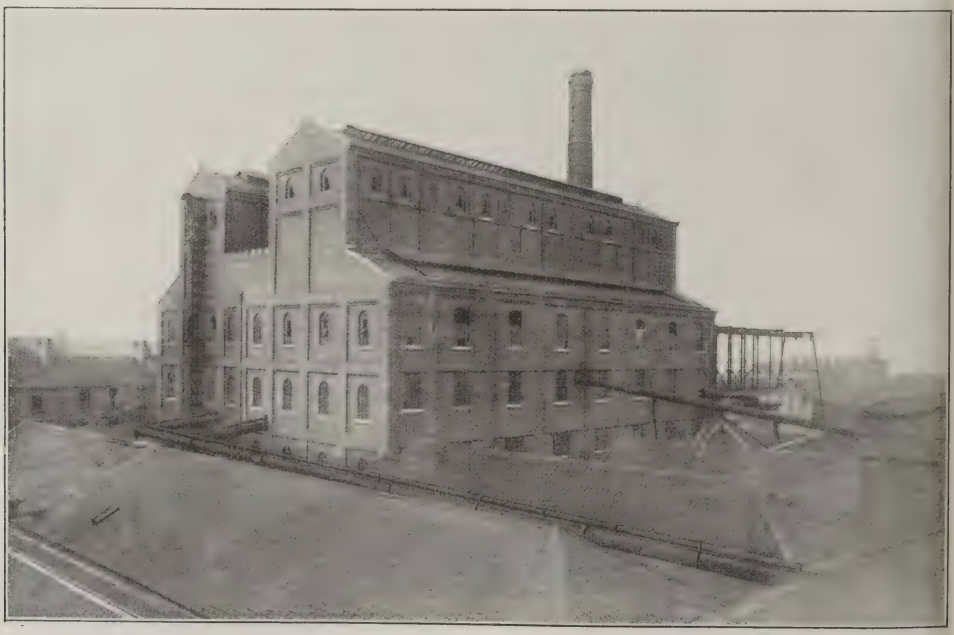
The new plant consists of twenty-four retorts built in settings of four. In comparison with the first installation, it is interesting to note that, per ton carbonized per day, there is a saving of ground space amounting to at least 25 p.ct.

A waste-heat boiler of the Woodall-Duckham fire-tube type has been provided; and when all the retorts are working at full capacity, the boiler is capable of generating 4200 lbs. of steam per hour at 100 lbs. per sq. in., from feed water at 60° Fahr. To ensure that steam used for steaming the retorts is absolutely dry, a superheater is provided in the inlet flue to the boiler, capable of raising the temperature of the steam to about 500° Fahr. In order to provide sufficient pull on the settings, an induced draught fan is provided at the outlet of the boiler, driven by a high-speed vertical steam engine. The feed water is heated by means of the exhaust steam from this engine.

Outstanding Features.

The outstanding features in connection with the new plant at Aberdeen which show the trend of improvements in vertical retort design may be summarized as follows:

1. Large units, working independently of each other, which can be regulated individually and shut down for scurfing or repairs without causing any interference with the remaining working retorts. The labour required to work the plant is the same per unit as that necessary for



WOODALL-DUCKHAM VERTICAL RETORT HOUSE.
Showing 1913 settings on left, and 1924 settings on right.

Producer Stage.

Conveying Plant.

smaller units, and thus considerably reduces the working costs.

2. The regulation of the temperatures in the combustion chambers is particularly easy, due to the ample area of all flues and the reserve capacity of the producers, and it is found possible to work the plant over long periods without making any adjustment whatever to the controlling dampers which are provided for the independent chambers of each retort.
3. The plant is worked under a very low draught; and thus infiltration of air into the waste gas flue is reduced to a negligible quantity, with the consequent saving of power for the induced draught fan of the waste-heat boiler.
4. The producers are of large capacity, and their particular feature lies in the fact that they will carry a reserve of fuel to last for 24 hours without unsealing their curtain arches.
5. The extractor gear is so silent that the Engineer has installed an indicator at the top of the setting level, so as to inform the top man should any stoppage occur to the extractor driving engine, or its stand-by motor.
6. The combustion chambers can be inspected at the top and the bottom in comfort; the sighting holes being readily accessible. Thus a complete set of temperatures can be quickly obtained.
7. The plant is particularly cool, both on the charging stage and on the damper control platform, due to the special attention that has been paid to the insulation of the outside walls on the top setting brickwork.

BRITISH COMMERCIAL GAS ASSOCIATION.

DISTRICT CONFERENCE AT HARROGATE.

A DISTRICT Conference under the auspices of the British Commercial Gas Association was held at Harrogate, on May 21; the meeting taking place at the Harlow Manor Hydro. The proceedings opened by a luncheon, at which about eighty were present. The subsequent conference was held in the delightful Winter Garden of the Hydro—fitting surroundings for discussion of the advantages of gas as a means of restoring to the public the benefits of sunlight, natural beauty, health, and cleanliness.

Mr. Francis Barber, Chairman of the Harrogate Gas Company, presided over all the proceedings of the day. At luncheon he was supported at the top table by the Mayor of Harrogate (Councillor C. E. Carter, J.P.), the Mayor of Halifax (Alderman J. H. Waddington, J.P.), the Town Clerk of Harrogate (Mr. Turner Taylor), Mr. J. H. Ellis (President of the "B.C.G.A."), Mr. A. Proctor (Chairman of the York Gas Company), Dr. R. Veitch Clark, M.A., M.B. (Medical Officer of Health for Manchester), Dr. James Mair, M.B., D.P.H. (Medical Officer of Health for Harrogate), Mr. F. H. Robinson, Assoc.M.Inst.C.E. (Engineer and General Manager of the Harrogate Gas Company, and President of the Manchester District Institution of Gas Engineers), and Mr. W. M. Mason (Manager of the "B.C.G.A.").

The first toast, following that of "The King," was to "The Prosperity of Harrogate," which was proposed by Alderman WADDINGTON in a characteristic speech, and replied to by Mr. CARTER.

PROBLEMS OF THE GAS INDUSTRY.

Mr. ALFRED PROCTOR, proposing a toast to the "B.C.G.A.," said he believed it was generally recognized to-day in the gas industry that, without the wonderful help of the Association, the industry would be much worse off. He was present at the inaugural meeting thirteen years ago, when Sir Corbet Woodall was the first President. He believed that Sir Corbet's prophecy that the "B.C.G.A." had heralded-in a new world for the gas industry had been amply fulfilled. For a long time now the trend of opinion had been in the direction of common action in the industry. The efforts of local undertakings could have little general success without the central organization of the "B.C.G.A." The question of the residuals market was very much in mind at the moment. They all knew the seriously adverse conditions of that market—conditions which had been reflected in almost every undertaking's balance-sheet for 1924. Nothing could be accomplished in this matter by local effort; but a strong central committee were considering the question, and they all hoped their work would tend in some degree to relieve the industry from the present adverse conditions. Another important subject demanding attention was the strenuous competition of the electricity industry. He believed gas was to be met by more intensive competition than ever before. The production and distribution of electricity was to be backed by the resources of the State. If the State considered it necessary to subsidize electricity, then he claimed that the gas industry should have the same treatment. The growth in consumption of gas, which was the universal experience of undertakings in 1924, was due in no small measure to the work of the "B.C.G.A." Results had shown that gas as a commodity for domestic and trade uses was growing strongly in popular favour. The industry had completed a century of gas supply. If one looked back on its history, one must be impressed by the extraordinary buoyancy and elasticity to changing conditions. The industry came to birth in a cloud of ridicule, and there had since been many crises. The competition of electricity had not extinguished the gas industry. On the contrary, it had been a great stimulus. One feature in the aims and ideals of the "B.C.G.A." which he would emphasize, and one which was consistently enlarged upon by Mr. F. W. Goodenough in his energetic work for the movement, was the ideal of public service. They must all recognize—whether municipal administrators or company controllers—that they were ministering very greatly to the daily needs and comforts of the people among whom they lived.

Mr. J. H. ELLIS, responding to the toast, said that the greatest object of the "B.C.G.A." was to publish the truth. The Association stood for clean and comfortable homes, for clean and comfortable towns, for cheapness and efficiency in industry; and he did not care what rival they had to face, provided the competition was fair. He had in his time been interested in both the electricity and the gas industries. What he said was: Let each be used where it is most economical and efficient. What they objected to was unfair competition; and they looked like getting it in the grossly unfair proposition to bolster up one industry with money wrung from the taxpayers, and at the expense of another industry. The gas industry had its exhibit at Wembley, and was appealing for support to gas undertakings, because it knew that bread cast upon the waters at Wembley would be returned a hundredfold.

PROGRESS AND PROSPERITY.

Mr. W. M. MASON, proposing a toast to the Chairman and Directors of the Harrogate Gas Company, read a telegram of greeting from Mr. F. W. Goodenough, Chairman of the Executive of the "B.C.G.A.," who wired: "To-day's 'Times,' 'Telegraph,' 'Morning Post,' and others show activity of Headquarters. Association's influence was very helpful in securing results. All good wishes." He (Mr. Mason) was sure all wished the Chairman and Directors of the Harrogate Gas Company success and prosperity. Prosperity was not merely a thing to drink to. It carried other aspects. The biggest

thing in prosperity was progress. The Harrogate Gas Company were making efficient progress. He was afraid the great public service rendered by the gas industry was often forgotten by the public who benefited from it. It would be remembered quickly enough if the service which had been enjoyed for generations, and which he was confident would be enjoyed for generations to come, was suddenly stopped. The greatest national festival in England was not the "Derby" or the football Cup Final. It was the Sunday dinner in every home in the country; at which period the gas industry was putting out more gas than at any time in the whole of the week. This showed how the public benefited by the gas industry.

AN ENTERPRISING UNDERTAKING.

Mr. FRANCIS BARBER, replying, gave an outline of the history of the Harrogate undertaking. He suggested that the record of service rendered by the public utility undertakings of this country, and particularly the gas undertakings, would always be worthy of the highest commendation. The Harrogate Gas Company not only supplied gas, but saw to it that the consumer got the best service from it. The undertaking had now 90 miles of mains, and they had an Order for taking-over the small undertaking at Pateley Bridge, twelve miles away, and including the area of that works in the Harrogate area of supply. They had at present 10,900 consumers, using over 20,000 gas appliances; and recent sales of apparatus had averaged about 2000 a year. They had a co-partnership scheme by which the workers enjoyed a share of the profits of the undertaking; and they were hoping shortly to arrange a superannuation scheme for the benefit of the aged or incapacitated.

THE CONFERENCE.

CHAIRMAN'S OUTLOOK.

At the opening of the afternoon conference, Mr. MASON read a letter from Mr. F. W. Goodenough, Chairman of the Executive, regretting his unexpected inability to be present.

The MAYOR OF HARROGATE gave a brief but hearty welcome to the conference, and mentioned that the gathering was one of a series of conferences which it was expected to hold at Harrogate during the present summer.

Mr. FRANCIS BARBER, in his opening remarks as Chairman of the meeting, said he was proud to give what support he could to the "B.C.G.A." It was his privilege to be present at the inaugural meeting of the Association, held in Manchester in October, 1912, under the presidency of Sir Corbet Woodall, whose name and work must always have a place in its history. The meeting left on his mind an impression of the erection of a massive structure in unity to be sustained by pillars which would not only maintain it against all attacks, but be strengthened by every attempt to shake it. He was glad to know his expectations had been fully realized. They must not forget, however, that the life and soul of the Association would always depend on the inspiration and the activities of those at its head. He wished to take the opportunity of bearing his personal testimony to those to whom they owed so much; and he hoped he was not out of place in singling out Mr. F. W. Goodenough as the very heart and inspiration of the movement, and Mr. W. M. Mason as its clever administrative head. It was a real personal disappointment to have been deprived at the eleventh hour of Mr. Goodenough's presence that day.

He believed the advantages the industry had gained by the work of the "B.C.G.A." had repaid with abundant interest the financial contributions the Association had received from the supporting undertakings; and he appealed to every concern outside the Association to make their proper contribution to the cost of the work from which they, like all others, were receiving so great a benefit. If they were called upon to fight so unjust a preference as that proposed to be given to electricity undertakings, it was necessary that the Association should be able to speak for every gas undertaking in the country, great or small.

THE ELECTRICITY SUBSIDY.

Turning to the electric subsidy question, he must express his astonishment that a Government elected on an anti-Socialistic policy should, through the responsible Minister, have declared their adherence to so deliberate a step towards the socialization of an industry as to propose to indemnify it against loss on its development in unremunerative areas. He was surprised that Mr. Philip Snowden, the outstanding apostle of Socialism, should have found so many ready disciples in the Cabinet of the present Government. If any industry was entitled to the generous support of the Government, it was the gas industry, which in the hour of the country's peril rendered service of incalculable value. ["Hear, hear."] They could never forget the mean and contemptible acknowledgment of those services which was embodied in the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, which left the proprietors with so small a return on their invested capital. No industry which did so much in support of its country's cause suffered more. If any preference were given to the electricity industry and were not also conceded to the gas industry, it would not be "cricket;" and he thought it would outrage that spirit of fair play upon which they as Englishmen prided themselves. Mr. Barber said he had for some time been a shareholder of several electricity undertakings, but he was not aware that they had sought the assistance which the Government proposed to give them. He believed they were developing on sound lines, and would be able, by their own resources, to finance all developments likely to be remunerative in ten, fifteen, or twenty years. He did not agree that electricity could bring to the rural districts advantages at all on a par with those to be obtained from gas. The gas industry had, indeed, a much stronger case for State assistance than could ever be put forward by its competitors. He emphasized the necessity for stern opposition to the proposal to subsidize electricity at the cost of the gas industry.

A COMPANIES' SECTION OF THE "B.C.G.A."

As Chairman of a Company undertaking, Mr. Barber said he would like the Association to consider the desirability of forming a Companies' Section. He thought this might be of great service. They had realized the benefits of close co-operation in matters generally affecting the industry, but there were many domestic matters concerning a company undertaking which did not affect municipal undertakings, on which conferences and common action by companies might be of great benefit. He would instance such matters as the raising of capital, standard dividends, rates of dividends, basic and maximum prices, assessments to local rates and taxes, precedents of Parliament in dealing with company legislation, and combined action to meet persistent demands of road boards and railway companies, for the insertion of special clauses in a Company's Act, and other matters in which they were concerned and in which the municipal undertakings were not.

LIGHT AND HEALTH.

Dr. R. Veitch Clark, M.A., M.B., Medical Officer of Health for Manchester, gave an extempore address, with the aid of charts, entitled "Light and Health," in the course of which he dwelt on the importance of sunlight to human health and prosperity, and the enormous influence of the smoke-pall, caused by burning raw coal, in creating disease and depriving people of the benefits of sunlight. Everybody who lived and worked in an industrial community, he said, was well aware of the intense gloom that settled over towns even in the summer months. He had noticed it himself in Manchester only the previous day. He was not at that conference as one having any interest in the gas industry, but as one who hated the coal chimney. To think that a black fog could settle on the town in May, in this age of science and civilization, was an absolute disgrace. Anything that would help to sweep away the intensely depressing conditions of industrial life was a thing to be encouraged by everybody in authority; and this was why he supported the gas industry. The speaker described the nature of the filth and products breathed by people in a smoky atmosphere, and the effect on the lungs and on health. These things of themselves undoubtedly hastened death, but even more important, probably was the fact that the smoke shut out the beneficent sunlight and the invaluable ultra-violet rays, the nature of which he proceeded to describe. Ages ago people worshipped the sun because they realized that it was the source of all life and health; and yet in these days of civilization we shut out the sun by our own folly. We went away from town to holiday places to get the sun which we could get at home if we did not burn raw coal. The speaker described sunshine treatment for tuberculosis and other disease in Switzerland, and at a sunshine sanatorium under his own charge in North Wales, and spoke of remarkable cures without the aid of medicine or surgery. He said he would urge the application of any kind of power or authority that would compel the minimization of smoke.

GAS AS A PUBLIC SERVICE.

By FRANK H. ROBINSON, Assoc.M.Inst.C.E.

Few people realize the extent to which gas enters into public life; most think only of its domestic uses for lighting, heating, and cooking, without realizing the extent to which gas and its bye-products enter into the manufacturing and business life of the country.

To dwell for a moment on the domestic aspect of the use of gas, it is interesting to know that to-day there are over 8½ million consumers in Great Britain and Ireland, and that more than half this number are supplied with gas through the prepayment meter. It is no exaggeration, therefore, to say that gas is giving service in some form or other, for cooking, heating, lighting, or hot water supply, in practically every home in the land. Another interesting point in this connection is that the greatest demand for gas throughout the country at any given time occurs between the hours of 11 and 1 o'clock on Sundays, when the millions of gas cookers are in use for preparing the Sunday dinner. This is a national festival that overshadows in importance the Derby or the Boat Race.

To turn to the use of gas in the industrial sphere, if I were to attempt to describe the variety of purposes for which gas is employed in the manufacture of practically every known want of man, I would need to write a treatise, as there are over 3000 known processes in which gas plays an important part. I propose, therefore, to deal only with the use of gas in a resort like Harrogate; but, before proceeding to this particular subject, there are one or two points with which I would like to deal briefly.

The scientific carbonization of coal on the gas-works is a

potent factor in the all-important question of the conservation of that national asset coal; and it is well that the public should realize that, in extracting the heat units from the coal and supplying them for the needs of the community in the form of gaseous fuel, all the valuable bye-products are recovered. They are wasted when coal is burned in its raw state.

Another point on which I should like to comment is the enormous magnitude of the gas industry. We see in some of the newspapers to-day fantastic claims and ideas with regard to the use of electricity being the "panacea for all ills." While we all recognize that electricity has its proper place in service to the community, we must view it in proper proportion, and not be misled by statements which are, to say the least, fantastic. The Governor of the largest gas company in the world, in a recent speech, made the statement that the total heat units supplied by that one Company alone to its consumers was greater than the energy supplied to this country by the whole electrical industry. When I tell you that that Gas Company's output represents between 12 and 13 p.ct. of the total output of the whole industry, you get some conception of the relative magnitude of the service which the gas and electrical industries are providing for the community generally. After well over a century of service to the public, the gas industry continues to progress, and is a much more lively and virile body than some of its competitors would have the public believe.

The hygienic aspect of the use of gas in the home is a subject of considerable interest and importance, and it is gratifying alike to the industry and, I suggest, to the general public that the claims made by the gas supply industry as to the many advantages of gas from a health point of view are supported and confirmed by the great bulk of the medical profession, who are big users of gas in their own homes and consulting rooms. It is a fact that, of the London residential districts, the Harley Street area, which houses the leading men in the medical profession, shows the largest consumption per acre. Similarly gas is very extensively used in a large number of hospitals, both in London and throughout the country.

Besides being noted as a spa, Harrogate has a wide reputation for a very pure atmosphere. The use of gas and coke has contributed very largely to the beautiful clear air of the town. Imagine for a moment what conditions would be like in Harrogate if the 11,000 gas consumers were to use only coal for their cooking and heating—every kitchen chimney belching forth smoke; every hotel, hydro, and boarding establishment doing the same; a procession of coal carts to these places; and the resultant procession of dust carts removing ashes every morning; black dust mixed with brown dust, soot and grime in the bedrooms, and over the town a pall of smoke. This would not attract people to Harrogate to take the "cure" or spend their holidays. It would also mean more traffic in the streets, more labour in handling refuse, and consequently higher rates, and larger staffs in the hotels and hydros. Altogether, apart from the effect upon the health of the inhabitants, the picture would not be good to look upon. I do not propose to touch on this side of the question, as it has been already dealt with in a most capable manner by Dr. Veitch Clark, the Medical Officer of my native city.

In Harrogate, there is scarcely a boarding-establishment, apartment-house, hotel, or hydro without gas for cooking purposes. This is a sufficient testimonial to the convenience, economy, and cleanliness of gas for this work. The gas cooker is always ready for use; there is no waiting for the fire to burn up; and no necessity to get up an hour earlier to provide breakfast for the visitor who wishes to catch an early train. Breakfast can be prepared at a few minutes' notice, and the cooker turned out when the meal is ready, and left out of use till it is time to prepare for lunch; and thus the kitchen does not become insufferably hot, as it would if a coal fire were used.

In the bathroom a gas geyser is most useful to the visitor in an apartment-house who desires to have a hot bath at any time, without having to give special notice to the landlady to have the water hot. In the larger boarding establishments the gas circulator or the coke-fired boiler is more suitable, providing, as it does, hot water at all times, and also a means of consuming, along with the coke, the combustible refuse which accumulates in such establishments.

There are many of the larger hotels and hydros in Harrogate with very complete equipments for heating and cooking by gas and coke, notably the Cairn Hydro, the George Hotel, the Harrogate Hydro, the Queen Hotel, and the Adelphi Hotel; but there are still proprietors who have not yet realized to the full the great advantages of gas for all purposes in the kitchen, still-room, or elsewhere.

The Cairn Hydro kitchen is fitted with a large gas roasting oven, three double gas ovens with hotplates, two large hotplates and boiling tables, one with ten and the other with six gas rings, a stand for two stockpots, also two vegetable steamers and a hot closet heated by steam derived from a boiler fired by coke. The still-room contains a gas-heated toaster, a hotplate, and two steam kettles. In the kitchen no solid fuel is used. This establishment caters for 300 guests. The general heating is done by radiators supplied from a coke-fired boiler. The gas undertaking therefore supplies all the heat for the feeding and warming of the 300 guests and the staff in this large establishment. It is therefore very much a public servant, and is always on duty.

The George Hotel, close to the Cairn Hydro, also has a very complete gas equipment. In the kitchen there are: A gas cooker with four ovens and hotplate; a gas cooking range, fitted into a recess formerly occupied by coal-fired ovens, comprising two pastry ovens and a large hotplate, mostly constructed by the Gas Company; a gas roasting oven; stock-pot stand made by the Company; a steam-heated bain-marie; a steam vegetable oven; a gas griller mounted on a gas oven. In the serving room there is a long steam-heated hot-closet and a Jackson boiler; while the still-room contains two gas-heated coffee urns, a six-burner boiling-table, and a large toaster. This hotel caters for about 130 to 150 guests. All the steam required is raised in a coke-fired boiler.

The Adelphi Hotel is another which has all-gas equipment. In the kitchen there are: A hotplate 6 ft. long, a toaster, a large double roasting oven, a single oven, and a stockpot stand. In the still-room and serving room there are: A Jackson boiler, two toasters, a hotplate, a 5-gallon boiler, and a large hot closet. All the above are gas-heated appliances. General heating is done by radiators from a coke-fired boiler.

The examples given above are only three among many, and are detailed to show how much the public are served by gas and coke in a health resort.

There is one advantage attached to the use of gas appliances in large kitchens which is sometimes overlooked—viz., the ease with which the place can be kept clean, particularly about the floor. Smoke and soot are absent, and the appliances can be placed upon stands, leaving a clear space beneath to permit of the floor being swept and washed. Also a re-arrangement of the appliances is easily obtained, if desired, without structural alterations, and additional appliances can be installed with nothing more than a pipe and perhaps a short length of flue. This cannot be done with coal-fired apparatus.

To give some idea of the extent to which gas can be applied

FIG. 1.—KITCHEN OF THE CAIRN HYDRO, HARROGATE.

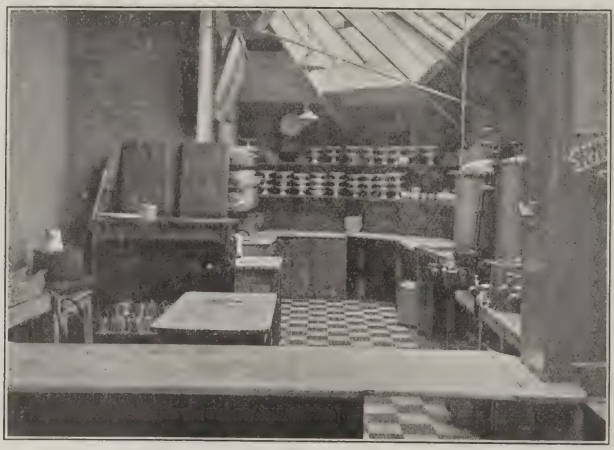


FIG. 2.—STILL-ROOM OF THE CAIRN HYDRO.

in catering for the needs of the public in seaside and health resorts, I have prepared the following list, which should not, however, be taken as exhaustive.

Cooking.—Gas roasting ovens, pastry ovens, hotplates, stockpot stands, vegetable steamers, grillers, pudding boilers, &c., bain-maries, fish fryers, &c.

Still-Room.—Gas boilers for hot water, coffee boilers, toasters, hot closet for keeping plates and dishes warm, &c.

Bathrooms.—Gas geysers, heated towel rails, circulators.

Corridors.—Gas radiators, or hot water radiators supplied from coke-fired boilers.

Bedrooms.—Gas fires with shilling prepayment meters.

Lounges, Drawing Rooms, &c.—Gas fires and radiators.

Garages.—Safety gas radiators.

For many years the bedroom fire has been a source of trouble and expense to both visitor and management. In the early spring or late autumn a fire in the bedroom is a boon. People coming to Harrogate for treatment at such times, and more so in the winter, find a bedroom fire not only a necessity but a comfort. They are often deterred from having one by the charges made for a coal fire and the nuisance of members of the staff having to attend to it, while the management of the hotel dislike having to light a fire with the consequent handling of coal, ashes, &c., and the extra labour involved. The result is that people avoid going away at these times, and the hotels lose business.

The gas fire with a prepayment meter attached overcomes these difficulties and provides the visitor with comforts such as he or she is accustomed to at home. The fire can be lighted when desired, to take away the chill of the room during (say) dressing for dinner or retiring for the night. In case the visitor is suffering from any complaint requiring warmth, the gas fire is available continuously or intermittently. To make a visitor comfortable is to attract custom, for each satisfied visitor is a missionary.

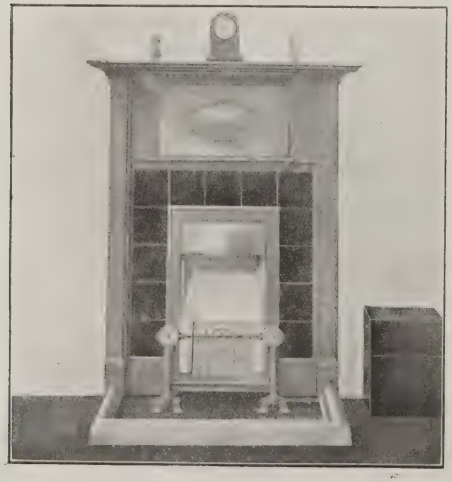


Fig. 3.—Typical Hotel Bedroom Gas Fire.

It must not be thought that the visitor gets all the benefit. It is a paying proposition to the management, apart from the attraction which it proves. The whole gas supply to the hotel or hydro passes through the main meter, and the establishment is charged at the usual price, subject to special discounts for large consumptions. The slot meters attached to the fires are set to give such a quantity of gas for a shilling as will cover the rent of the meter, if any, and leave a margin to pay interest on the capital cost of fire and piping. Take the following case with the costs given :

Gas (460 B.Th.U.) at 9d. a therm (gross) less 10 p.ct. discount			8·1d. net.
Gas fire, with piping, average cost	£5	15	0
Hire of extra meter, 1s. a quarter = 4s. a year	0	4	0
Slot meter set at 216 c.ft. a shilling = 4s. 7½d. per 1000 c.ft. net, or 1s. a therm net.			

If we assume the fire to be used only two hours a day for 150 days in the year, some 10,500 c.ft., or 48 therms, would be used in the average bedroom, costing the visitors about 2d. an hour. In other words, the visitor would have the benefit of a fire for dressing, morning and night, for a whole week for two shillings, which is much less than the cost of coal fires for that period.

The cash put into the meter in the year would be £2 8s. This amount could be collected by the gas inspectors, and credited to the gas account of the hotel, or by the hotel management, as may be arranged. The costs would then work out as follows :

	£	s.	d.
48 therms at 8·1d. net	1	12	5
One year's rent of slot meter	0	4	0
	£1	16	5
Received from slot meter	2	8	0
Annual profit to hotel proprietor, per fire = 10 p.ct. on capital expenditure.	0	11	7

These figures are based on the actual costs and prices in the case of a private hotel in Harrogate with seven such gas fires, and show the benefit to be obtained even where there is no winter season. The proposal is even more attractive to both visitor and hotel proprietor in places such as Bournemouth, Torquay, Hastings, Eastbourne, &c., where there is a winter season. The service given by gas to the public in such resorts is not limited to the hotels and hydros, &c. The bread and confectionery supplied to the tables is baked in gas and coke heated ovens at the local bakehouses. When the visitors take a stroll in the town or the gardens, and have afternoon tea, gas is again their servant in providing tea, toast, &c. Again, when they go to the theatre or concert hall, and the night is chilly, heat from the radiators is available to make them comfortable; the source of that heat being coke, a product of the gas-works.

In the boarding schools and colleges, of which there are many in Harrogate, the equipment in the kitchens is very similar to that of the hotels. The Ladies' College, Queen Ethelburga's School, Pannal Ash College, Ashville College, and New College have a considerable amount of gas apparatus in the kitchens. In all such places the use of gas makes for cleanliness, economy, convenience, and reduction of labour, combined with absolute reliability, which cannot be obtained by the use of coal. The regulation of the heats for the various cooking and heating operations is more easily obtained; and consequently there is less waste. If no such benefit had been

obtained, the use of gas for these purposes would not have extended at the rate it has done.

Before the commencement of the holiday season, the appliances at most places are examined, repaired, and adjusted by us. Likewise, the schools and colleges have their apparatus overhauled before the commencement of each term. In addition, the Company's gasfitters are available at any time for keeping all appliances working at full efficiency. Too often it occurs that results are spoiled through proprietors not taking the trouble to acquaint the Gas Company of their difficulty, though the Company have expert advice and assistance at free disposal. No charge is made either for advice or for the regulating of apparatus, but only for repairs, cleaning, and overhauling. If such proprietors would realize that it is economical to have regular inspection, and keep their appliances in good repair, they would be doing themselves, their customers the visitors, and the Gas Company a service.

Many people talk glibly about gas being done for; but they do not appreciate how much they are dependent on the gas undertaking, especially when they go away from home. The foregoing will, I hope, serve to make the people realize how much gas is a public service. There is plenty of room for further use of this service. Some who cater for the public needs have found its value, but there are many others who have not yet completed their education.

Discussion.

Dr. JAMES MAIR said that Dr. Veitch Clark had put the subject in so lucid a manner that little was left to add. He certainly agreed entirely with what had been said. Recently he had read a book entitled "The Smokeless City," by Mr. Simon, formerly Lord Mayor of Manchester, who took Manchester as the type of smoky city and Harrogate as the smokeless town. In Harrogate, it was true, the nuisance from industrial smoke was practically non-existent, but there was the smoke from houses. The domestic smoke in Harrogate did not, perhaps, shut out the ordinary sunlight, as did industrial smoke, but it did cut off the ultra-violet rays which were so valuable. He would be interested to have the views of Dr. Clark or any other authority as to the best means that could be taken to prevent this pollution of the atmosphere by smoke. In many industrial towns they had legislative powers which to some extent dealt with industrial smoke, which, he believed, was being reduced; but there was no power to prevent house smoke. They must make the public realize the evil of this smoke.

Mr. ELLIS said the question of coal conservation had recently been raised in Parliament by Lady Astor, who suggested that the legislature should do something further. By all means do everything possible by legislation, said Mr. Ellis; but he had far greater faith in publicity of such important and vital scientific facts as Dr. Veitch Clark had given to the meeting. This was what the "B.C.G.A." were out to do.

Councillor DAY (Halifax) said he was entirely in agreement with the views expressed by Dr. Veitch Clark. In Halifax they were trying to do their part to recover the benefits of sunshine.

Mr. MALLINSON, Proprietor of a Harrogate hotel, said his was the hotel to which Mr. Robinson had referred in mentioning an installation of gas fires in bedrooms. He had four installed, and was so satisfied that he got another five, and now he had received bookings from visitors specifying the bedrooms in which were gas fires. He found also that the fires saved him at least one servant.

The MAYOR OF HALIFAX said he had been Chairman of the Gas Committee there for many years, and in Corporation houses now they were making no provision for the burning of raw coal in bedrooms. If public representatives would take up the great question of the smoke evil, and apply their convictions to the prevention of coal fires in bedrooms, they would achieve a great deal.

Dr. CLARK and Mr. ROBINSON briefly replied.

On the motion of Mr. MASON, thanks were tendered the Chairman and all who had contributed to the success of the meeting.

New Holder at Marsden.—Messrs. Firth, Blakeley, & Co., of Church Fenton, have just completed for the Marsden (near Huddersfield) Urban District Council a new gasholder of 200,000 c.ft. capacity. The holder stands on Council land adjoining the gasworks.

Price of Gas at Arbroath.—The Arbroath Town Council have been assured by Mr. John Souttar (the Convener of the Gas Committee) that there is no prospect of an increase in the price of gas. Contracts have been entered into for 11,500 tons of coal, at a price of about 5s. 7½d. per ton less than last year.

Smethwick Gas Undertaking.—In his annual report for the year ended March 31, Mr. Ernest Hardiker, Engineer and Manager, records an increase in the consumption of gas of over 94 million c.ft., equal to 12·83 p.ct. The use of gas for industrial purposes, he mentions, has risen from 84 million c.ft. in 1910, to 366 millions during the past year. This is equal to 45·91 p.ct. of the total quantity sold. Mr. Sidney Taylor, Borough Treasurer, states that the gross profit for the year was £29,538, and the net profit £10,196.

Meters, Ltd.—The report to be submitted at the meeting in Manchester next Wednesday (June 10) states that the accounts for the year ended March 31, with the balance brought forward, show a total sum of £26,876; and after deducting interim dividends, there is a balance available for appropriation of £20,204. The Directors recommend the payment of final dividends of 2½ p.ct. (actual) upon the preference shares, and of 6 p.ct. (actual) upon the ordinary shares—making the total dividends for the year 5½ p.ct. on the preference shares and 8½ p.ct. on the ordinary shares, both less income-tax. This will leave to be carried forward a balance of £7812, subject to corporation profits tax.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Subsidizing Electricity.

SIR,—There is more than one way of killing a cat!

I am to an extent in sympathy with Mr. Milne Watson's attitude in regard to the proposed subsidizing of the electric undertakings by the Government. At the same time, I realize that there is a far better way of meeting this matter than by crying over it. The gas industry is blessed with an Act of Parliament that allows all qualities of gas to be distributed; and it would be a fairly good answer to the gas industry's cry if the Government said: "We are subsidizing electricity to make competition with you keener, and to cause you to look to the methods you adopt."

I have maintained for some years that coke production is fatal to the gas industry's interests. On the other hand, the leaders of the gas industry claim that coke-making is essentially an integral part of the process of town gas production. I join issue with these leaders, and ask them to declare frankly what the costs of coke production are.

Let the proposition be examined in the light of the following questions:

(1) Why does the gas industry favour the production of a rich gas and a make of 70 therms per ton, with coke?
(2) Why does the industry not produce (say) 170 therms and no coke?

If any gas undertaking's accounts be examined by an unprejudiced accountant, it will be found that coke production costs at least as much as is obtained for it outside the cost of the coal from which it is obtained. For example: 13 cwt. of coke are produced per ton of coal. It requires no effort to realize the 13/20ths of the manufacturing plant is provided and used for the manufacture of coke.

	Per Ton of Coal Carbonized. s. d.	£ s. d.
Cost of coal . . .		1 13 2
Repairs and maintenance of works . .	15 4	
Wages, carbonizing .	3 2	
Capital charges, including profit . .	14 8	
		1 13 2
		£3 6 4

	s. d.	£ s. d.
Cost of coal due to coke production, 13-20ths of £1 13s. 2d. . . .		1 1 6
Proportion of repairs and maintenance of works due to coke production, 13-20ths of 15s. 4d. . . .	10 0	
Do. wages, carbonizing, 13-20ths of 3s. 2d.	2 1	
Do. capital charges and profit, 13-20ths of 14s. 8d. . . .	9 6	
		1 1 7
		£2 3 1

The sale of coke per ton of coal realizes 16s. 4d.

These figures, taken from actual accounts, show that the cost of coke per ton of coal carbonized is £2 3s. 1d. If £1 1s. 6d. be deducted, the amount left is £1 1s. 7d., and yet the coke is sold for 16s. 4d.—a dead loss, outside the cost of the coal, of 5s. 3d.

The total loss on coke production is £2 3s. 1d., *less* 16s. 4d.—that is, £1 6s. 9d. per ton of coal carbonized, and this without reckoning the office or other standing charges for the production and salesmanship of coke.

Do not let us imagine, therefore, that coke production is a profitable part of our business. Is it absolutely essential to produce coke? If so, little or nothing can be said. But is it?

GEORGE HELPS.

Nuneaton, May 25, 1925.

Heating Bath Water by Electricity.

SIR,—On more than one occasion we have crossed swords on matters relating to electricity supply, and I think our discussions have been conducted without acrimony on either side. Your comments in "Electricity Supply Memoranda" dated May 27 on Poplar Baths calls for a reply from me regarding the cost of supply of electricity for heating bathing water.

I am not at all surprised at your comments, because, prior to giving consideration to this form of heat supply, I was of a similar opinion to yourself, as was possibly every engineer in the country. You know, however, the old adage "fools rush in where angels fear to tread"; hence, I suppose, your reference to the "real live" Electrical Engineer of Poplar.

You assert that the electric heating of water is an "impudent stunt," and that it is not cheaper than gas. The circumstances of the case are as follows:

When these baths were instituted, the Poplar Baths Committee applied to the Gas Company for a supply on trade terms—viz., 35 p.ct. off ordinary standard price, which the Company refused to grant. I found that it would pay my Committee to supply at equivalent prices, and it was decided to instal a small heating outfit at our Wick Lane establishment. Immediately the Gas Company became aware of our intention, they agreed to the factory terms, which rendered the proposition before me totally different. However, I was convinced that this problem had opened-up enormous possibilities for the outlet of electrical energy, and I recommended my Committee to agree to supply at average fuel cost only. I gather from your remarks that this is what you object to. The present cost of electricity is now less per bath than gas at current rates, and the saving effected in maintenance is all to the good.

You are perfectly aware from the information given in the "Memo-

randa" relating to off-peak periods that this sort of supply is a bye-product, and must be regarded as such. In your own industry bye-products are worth exactly what they will fetch in the market. You cannot shut your eyes to this fact, as all the important gas companies have recently raised their charges by 10 p.ct. on account of the drop in value of their bye-products.

Your quarrel with me seems to be that I ought to overlook the cost of supply with charges that are not incurred in giving this particular supply, which does not incur "distribution, capital, and other charges."

You are entirely wrong in assuming that the actual cost of production is greater during off-peak periods than at other times. Stand-by costs are higher; but these, again, do not apply to this class of load, as they would have to be incurred whether we were supplying baths or not.

The actual figures are 2¾ lb. coal per unit without stand-by; cost of coal 0·1d. per lb. Therefore cost per unit is 0·25d., *plus* conversion and distribution 20 p.ct., actual cost 0·3d.; but we are charging at the "average" cost of fuel, which is 50 p.ct. greater.

Now in your case the supply is not a bye-product, and probably with 35 p.ct. off your selling price there is not much margin for profit. I do not suppose for one moment that the "Gas Company are such asses as to supply gaseous energy at bare net fuel cost;" but there is no comparison between gaseous energy and electrical energy, and the inference which you evidently intend to convey that my Committee is comprised of "such asses" loses its point.

I think you will agree with me that the only thing that matters in connection with the supply of any commodity is the price at which such commodity can be supplied.

The irony of the matter is that I should never have been called upon to consider the question if the Gas Company had been reasonable at the outset, and had allowed factory terms. When developments have reached the point of justification, it is the gas industry that "squeals."

Now let me tell you something which may interest you more than the "queer things done in Poplar."

You are aware that a 30 p.ct. load factor is good for an industrial electricity supply undertaking. You will realize that an average of 70 p.ct. of plant and mains is practically idle all the year round. When it is generally recognized that certain supplies can be given at an average fuel cost with profit to any undertaking, I venture to predict that the gas industry will find the electricity industry a healthy competitor in water heating.

Another "queer thing" that Poplar is doing is to erect a power station that will utilize waste products of collieries. In many cases products that are now waste have a calorific value of 10,000 B.Th.U. and over. Energy will be generated from about 1⅛ lb. of this waste, and the price will be certainly not less than 33⅓ p.ct. of present coal prices; therefore the cost per unit, allowing for conversion and distribution, will not exceed 0·15d.

The "real live" Electrical Engineer of Poplar cannot afford to rule out fuel costs altogether, but these costs will be so small, and the field of supply so vast, that the Gas Company will feel sorry that they brought about competition of this sort.

In this instance, there will be no "scandalous misuse of coal," as no "coal" is required; therefore the outcry of "extravagant heat expenditure" will prove of little avail to the gas industry.

I am sending your paper to Mr. Jefferson Hope, who may think it worth while to reply to the second and third paragraphs of your "Memoranda;" but I would just like to mention that the cost quoted by you, 0·517d. in September, 1923, has now fallen to 0·338d. in March last, with every prospect of a steady decrease until the new station is in working operation.

I. HORACE BOWDEN,
General Manager and Chief Engineer.

Electricity Works, Glaucus Street, Bromley-by-Bow, E. 3,
May 29, 1925.

[This letter arrived during the Whitsun holiday absence of the writer of "Electricity Supply Memoranda;" but we will not delay its publication.—ED. "G.J."]

REGISTER OF PATENTS.

Non-Atmospheric Gas Burners.—No. 211,473.

BAKHUIZEN, W., of Potsdam.

No. 3596; Feb. 12, 1924. Convention date: Feb. 13, 1923.

The patentee claims: A non-atmospheric burner of the kind in which the burner head is provided with converging nozzles or jets arranged in pairs or in groups, distinctive by the axes of the nozzles of each pair or group being disposed at an inclination to one another constituting an extremely acute angle—for example, 10°—so that the flames unite or touch each other in a manner lengthening or pulling them out distinctive from broadening. The pairs or groups of nozzles are arranged in circles one above another in the wall of the burner head, or concentrically in the top of the burner head, which has vertical, horizontal, or oblique depressions or grooves cut in it.

Wash Boilers.—No. 232,694.

SUGG, W., & CO., LTD., and SUGG, P. H., both of Chapter Street, S.W. 1.

No. 2071; Jan. 25, 1924.

This invention seeks to prevent condensed water containing iron oxide finding its way back into a wash boiler, and splashings running down to the gas burner.

The outer casing is provided with an out-turned flange having an annular groove engaged by a corresponding bead on the out-turned flange of the inner pan. A ring of asbestos or other suitable material is inserted in the groove.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Kilmarnock Gas and Water Provisional Order Bill: Brought from the Commons, read the first time, and deemed to have been read the second time and reported from the Committee.

Stockton-on-Tees Corporation Bill: Read the second time, and committed.

Gas Light and Coke Company Bill: Reported, with amendments.

Blackpool Improvement Bill and Oldham Corporation Bill: Read the third time, passed, and sent to the Commons.

South Metropolitan Gas Bill: Brought from the Commons, read the first time, and referred to the Examiners.

Mansfield Corporation Bill: Reported from the Select Committee, with amendments.

Forfar Gas Order Confirmation Bill: The Royal Assent reported.

HOUSE OF COMMONS.

Progress of Bills.

South Metropolitan Gas Bill: Read the third time, and passed.

Gas Regulation Act.

Copies were presented of the drafts of Special Orders proposed to be made by the Board of Trade under section 10 of the Act, on the applications of the Preston Gas Company, the Harrogate Gas Company, and the Hastings and St. Leonards Gas Company.

On the motion of Sir Burton Chadwick, the draft Special Orders relating to the Trowbridge undertaking of the British Gas Light Company, and the Haverfordwest Corporation were approved.

GAS LIGHT AND COKE COMPANY'S BILL.

The Unopposed Committee of the House of Lords (presided over by the Lord Chairman, the Earl of Donoughmore), on Tuesday, May 26, ordered this Bill to be reported for the third reading. There have been no amendments, other than matters of drafting, since the Bill left the House of Commons. (The provisions of the Bill, and the proceedings in the House of Commons, were dealt with in the "JOURNAL" for Jan. 7, p. 30, and April 1, pp. 29 and 61.)

MANSFIELD CORPORATION BILL.

This general provisions Bill has been before a Committee of the House of Lords for some days, and has now been ordered to be reported for third reading. Originally, it contained a clause relating to the gas undertaking of the Corporation, relieving the Corporation of the obligation to supply gas for other than lighting and domestic purposes from any main the capacity of which is insufficient. This clause has been the subject of objection by the railway companies for a long period; and prolonged negotiations have been taking place between the National Gas Council and the railway companies, with a view to arriving at an agreement as to the form which the clause should take. Agreement has at last been reached, and, in consequence, the clause in its original form in the Mansfield Bill has been deleted, and the agreed clause substituted.

The original clause in the Mansfield Bill was as follows:

> "Notwithstanding anything in any enactment to the contrary, the Corporation shall not be obliged to give from any main a supply of gas for any purpose other than lighting or domestic use in any case where the capacity of such main is insufficient for such purpose, or if, and so long as, any such supply would, in the opinion of the Corporation, interfere with the sufficiency of the gas required to be supplied by means of such main for lighting or domestic purposes."

Prior to the agreement which has now been reached, there have been attempts on the part of the railway companies to have the matter fought out in Parliament; and for this purpose they have opposed various Bills containing the clause in the above form. In most cases, however, the promoters have withdrawn the clause. The railway companies have also lodged objections to the clause when it has been included in Special Orders which the Board of Trade have been asked to make in favour of various gas undertakings; and it had more or less become the practice for the promoters of these Orders to delete the offending clause, pending the agreement which it was hoped would result from the negotiations taking place between the railway companies and the National Gas Council, and to insert the agreed clause in its place. A number of Orders were granted, however, before agreement was reached, and these did not contain any clause dealing with the matter.

Subsequently, an Order was promoted by the Pinner Gas Company in connection with which this matter was raised; and when inquiry into the granting of the Order was held at the Board of Trade, the Company intimated their resolve to have the matter referred to a Parliamentary Committee for decision. [Proceedings at the Board of Trade in connection with the Pinner Order were reported in the "JOURNAL" for June 18, 1924, p. 582.] The matter was subsequently referred to a Committee of the House of Commons (see "JOURNAL" for Aug. 6, 1924, p. 524), and the result of the discussion there was that the matter was postponed until the Autumn Session of Parliament, with a view to the parties arriving at some form of words to meet the difficulty. The clause in the Pinner Order was practically the same as in the present Mansfield Bill. A previous case in which this matter was referred to a Parliamentary Committee was that of the Special Order of the Marple Urban District

Council (see "JOURNAL" for April 9, 1924, p. 123), but in that case the clause was withdrawn because the Urban District Council were not in a financial position to fight the railway companies in Parliament.

THE AGREED CLAUSE.

The agreed clause which has been inserted in the Mansfield Bill, and which has also been inserted in the Board of Trade Order to the Pinner Gas Company is as follows:

"Unless at the date of the demand for any such new or increased supply of gas as is hereinafter referred to the capacity of the distribution works of the Corporation is, in the opinion of an arbitrator, appointed as hereinafter provided, insufficient to meet (with a reasonable margin) the requirements (as existing immediately before that date) of the consumers in the portion of the area of supply of the Corporation for which such works have been provided (so far as such requirements could reasonably have been foreseen), the Corporation, notwithstanding anything contained in any other enactment, shall not be obliged to give for any purpose other than lighting or domestic use—

(*a*) A new supply of gas for the premises of any person demanding such supply at any time after the passing of this Act; or

(*b*) an increased supply of gas (other than an increased supply necessitated by any reduction of the declared calorific value of the gas);

where the giving of such new or increased supply would render necessary the laying of a new main or the making (as an alternative to the laying of a new main) of any enlargement or alteration of, or addition to, the distribution works of the Corporation. Provided that the foregoing provisions of this section shall not apply in any case in which the person demanding the new or increased supply (in this section referred to as "the applicant") shall enter into a written contract with the Corporation—

(i) To receive and pay for a supply of gas of such minimum quantity and for such minimum period as the Corporation may reasonably require; or

(ii) to make such payment or payments to the Corporation (in addition to any payments to be made from time to time for gas supplied to the applicant) as the Corporation may reasonably require;

(according as the Corporation may in their discretion determine) in consideration of, or by way of contribution towards, the expenses to be incurred by the Corporation in laying such new main or making such enlargement, alteration, or addition as aforesaid, and shall give such security for the payment of all moneys which may become due under the contract as the Corporation may reasonably demand. Provided also that, if any question shall arise under the provisions of this section between the Corporation and the applicant as to the sufficiency of the distribution works of the Corporation, or as to whether such new or increased supply would necessitate the laying of a new main or the making of any such enlargement, alteration, or addition as aforesaid, or as to the reasonableness of the minimum quantity or period or of the payments (in addition to payments for gas supplied) required by the Corporation, or as to the nature or amount of the security demanded by the Corporation, such question shall be referred to and determined by an arbitrator to be appointed (failing agreement between the Corporation and the applicant) by the Board of Trade on the application of either party after notice in writing to the other of them; and the decision of such arbitrator shall be final and binding. Provided also that, in determining any such question as aforesaid, the arbitrator shall have regard to the following, among other, considerations (that is to say):

(A) The total annual quantity of gas required by the applicant, the maximum quantity required per hour, and the hours of the day during which the Corporation may be called upon to supply gas to the applicant.

(B) The capital expenditure which the Corporation would have to incur in the laying of a new main or the making of any enlargement or alteration of, or addition to, their distribution works as aforesaid in connection with the giving of such new or increased supply.

(C) How far such capital expenditure may become unproductive to the Corporation in the event of the cesser of the new or increased supply.

Subject as aforesaid, the provisions of the Arbitration Act, 1889, shall apply to any arbitration under this section.

BARROW-IN-FURNESS CORPORATION BILL.

This Bill (see "JOURNAL" for Jan. 21, p. 142, and April 15, p. 187), which contains a number of clauses of a general character relating to the Corporation's gas undertaking, was ordered by the Unopposed Committee of the House of Lords (presided over by the Lord Chairman, the Earl of Donoughmore), on Tuesday, May 26, to be reported for third reading. There are no substantial changes in the gas clauses since the Bill left the House of Commons.

NEW SHOREHAM HARBOUR BILL

The Unopposed Committee of the House of Commons, presided over by Mr. JAMES F. HOPE (Chairman of Ways and Means), on Tuesday, May 19, ordered this Bill to be reported for third reading. Its purpose is to enable the Harbour Trustees to continue for a further period to increase their statutory maximum rates and charges by 100 p.ct., and to purchase land for the development of the harbour. There was originally a petition against the Bill by the Brighton and Hove General Gas Company, whose coal is discharged in the harbour, but the petition was withdrawn as the result of agreement being reached. The Gas Company objected to the Trustees having power to acquire part of their lands, and to the extension of the power to charge increased rates permanently. The increase was originally given under an Order which was strictly temporary in character, and which contained a provision, inserted at the instance of the Gas Company, requiring the Trustees to spend the additional revenue obtained as the result of the increase of rates for the benefit of the harbour undertaking; and it was pointed out by the Gas Company that, under the powers sought in the present Bill, the Trustees would be able to apply the revenue to purposes of a different character.

Mr. C. F. BAKER (Messrs. Bircham & Co., Parliamentary Agents) said that, whereas the Bill originally provided for a permanent increase of the statutory maximum rates by 100 p.ct., it was now provided that the increase should operate for three years from December, 1925.

There was a clause in the Bill providing that, if the Gas Company and other bodies mentioned, and the Harbour Trustees, should agree in writing a scheme for the reorganization, reduction, and consolidation of the existing capital of the Trustees, for the raising of additional capital by the Trustees, and the reconstitution of the Trust, and other incidental matters, the Trustees are to promote a Bill in the next available session of Parliament to give effect to this scheme, and to include such other matters as may be agreed between the parties mentioned. If no Act to give effect to such a scheme has been obtained by the Trustees before Oct. 1, 1927, the Gas Company and the other bodies may promote a Bill for the purpose.

Replying to questions by the Committee, Mr. Baker said that this arose out of efforts which were being made to agree to a scheme between local authorities and the Gas Company on the one hand, and the security holders on the other, for the reorganization of the finances of the Trustees. What was being aimed at was the reduction and consolidation of capital.

Asked why the Gas Company were included, he said that they had a very large interest in the success of the Harbour, as the gas-works were dependent upon it.

LEGAL INTELLIGENCE.

GAS PIPES AND ROAD FILLING.

Liverpool Corporation to Pay Damages.

At the Manchester Assizes last week Mr. JUSTICE FINLAY gave judgment in an action which had been heard by him on four days at the last Liverpool Assizes. The substance of the case was a claim by the Huyton and Roby Gas Company, Ltd., for damages from the Corporation of Liverpool for injuries to their gas mains alleged to have been caused by the negligence of the defendants or their contractors.

The Judge held that a series of six fractures which occurred in gas pipes of the plaintiff Company in Archway Road and Roby Road during 1923, 1924, and 1925 was caused by the failure of the contractors, who laid down a water main for the defendant Corporation in 1923, so to restore the road as to afford adequate support to the gas pipes of the plaintiff Company. He was satisfied on the evidence that the fractures complained of, which resulted in several explosions of gas, were caused by subsidences which imposed an undue strain on the gas pipes. As to the suggestion for the defence that the plaintiff's pipes were laid too near the surface for safety, the Judge said it might be expedient in modern practice, having regard to the greatly increased strain imposed by the passage of heavy vehicular traffic at high speeds, to lay pipes deeper under the surface; but this did not relieve the defendants of their obligations. Before the water main was laid, there were no fractures in the gas pipes; and afterwards there were six fractures, of which no less than four occurred at points where the water main crossed the line of the gas pipes.

Mr. Justice Finlay dealt at some length with the defence that the plaintiffs were debarred from recovering under a provision of the Public Authorities Protection Act, 1893, which enacts that no action may lie unless begun within six months of the cessation of the acts complained of. He held that the time limit mentioned did not begin to run until the neglect ceased. In this case the defendants were under an obligation to fill-in the road properly after excavating. The road was not filled in with due care, and was still in the same condition; and the defendants were liable for damages caused by their failure and neglect.

He gave judgment for the plaintiff Company for the full amount claimed (£83), and, referring to the plaintiff's original claim to an indemnity, said that probably the judgment he had given would fulfil the same purpose; but as Counsel had agreed that the claim for an indemnity could not be pursued, he gave no judgment on that issue.

Public Lighting at Hereford.—In view of the criticism evoked in consequence of the discontinuance of public lighting, it has been decided to resume the public lighting until the date of next meeting of the Town Council, when the whole subject will be reconsidered.

Accrington and District Gas Board.—At a meeting on May 28, Mr. A. J. Harrison (General Manager) said they had just balanced their accounts for the municipal year. The increase in gas sales had been very satisfactory, totalling 37,352,000 c.ft. The unaccounted-for gas was less than the previous year by ten million c.ft. The expenditure on gas production and distribution was £92,143, or £3738 above last year. The income totalled £125,348, or £381 less than last year. Gas revenue had increased by £329. The total profits on gas were £33,204. Standing charges absorbed £32,878, so that there was an actual net surplus of £326. They proposed to place certain additions to plant to revenue account; and this would absorb that little surplus. It was not proposed to recommend any alteration in the prices during the present year.

MISCELLANEOUS NEWS.

BELFAST GAS UNDERTAKING.

The Engineer and Manager of the Belfast Gas-Works (Mr. J. D. Smith) has received the commendation of his Committee on the satisfactory nature of his annual report. His recommendation to extend the power rate to include gas used for cooking in hotels, restaurants, and large catering establishments was adopted.

The report shows the balance brought forward from the previous year to be £11,492. As the result of last year's working, this had been increased to £19,827. The gas made showed an increase of 120 million c.ft. The quantity of coal carbonized was greater by 10,187 tons. The production of water gas was reduced by about 12 p.ct.; and consequently there was a saving of 423,725 gallons of oil. The sale of coke continued to expand. The extra revenue from this source amounted to £13,650, and the sale had been very steady. The demand for gas increased year by year; and this was not to be wondered at, in view of the low price charged. The increase in sales through ordinary meters was 77 million c.ft., and through automatic meters 123 millions; while the increased revenue for the year amounted to £7010. Not only was the output larger, but they had a remarkable addition to the number of consumers, the increase for the year being 1925, bringing the total number of meters installed up to 90,549.

The chemical department had continued its prosperous career. There was a substantial increase in the output of tar and ammonia; and though the revenue was only increased by £911, this was entirely due to the drop in market prices. The production of tar and liquor constituted a record, and the chemical department had not experienced any difficulty in selling the entire production. The demand for all patterns of stoves had been enormous. The future for gas was, undoubtedly, largely in this direction. The total number of fires, heaters, &c., in use was 65,895—an increase of over 7900. The process of installing in the works the best and most modern plant had gone forward steadily, and all the appliances had been maintained in a thoroughly efficient manner. Contracts had recently been placed for new exhausters, condensers, and scrubber-washers. The balance in hand at the end of the last financial year was not sufficient to justify any reduction in the price of gas for lighting; but he thought the Committee could safely extend the power rate so as to include the gas used for cooking in hotels, restaurants, and large catering establishments. They were now feeling the benefit of the policy of modernizing the works. With gas at the cheap price at which it was supplied, there was practically no limit to the possibilities of the future.

The accounts for the year show that the gross profit on the manufacture and sale of gas and residuals was £110,671, and that out of the net profit a sum of £11,473 was paid in respect of dividends and sinking fund on the City Hall stock.

SAFEGUARDING OF INDUSTRIES ACT.

Gas Mantles.

(*Continued from p.* 611.)

Friday, May 22.

The Committee resumed their inquiry on Friday, May 22.

At the commencement of the proceedings, Mr. MACASKIE (Counsel for the opponents) made the request that he be provided with the British costs of production of gas mantles.

The CHAIRMAN asked whether these costs were material to the opponents.

COUNSEL submitted that they were.

The CHAIRMAN said that the applicants had given their costs to the Committee privately, and the opponents also could give their costs *in camera*.

Mr. *Soper* then re-entered the witness box, and was questioned further by the Chairman. As to the British exports of mantles, he said these totalled slightly over three million mantles a year. He believed that about 95 p.ct. of these went to the British Dominions, and practically none to foreign countries, because the British manufacturer could not get into those countries.

As to Mr. Soper's statement, in evidence, that he would prefer a flate rate to an *ad valorem* duty on imported gas mantles, the Chairman asked what it was considered this flat rate should be.

Mr. *Soper* said that under the Safeguarding of Industries Act, 1921, a 33⅓ p.ct. *ad valorem* duty was imposed. At present the average import price of German mantles was 21s. per gross, and the equivalent of that duty would be 7s. per gross. This, however, would not afford protection against importation from countries where conditions of labour were more unfair than in Germany. He considered there should be a flat rate duty of 10s. per gross.

Mr. *Bernard Hiller* (Traveller, of Messrs. Joseph T. Robin, Ltd.) gave evidence to the effect that it was hardly possible to sell British mantles against foreign mantles. He was selling the ordinary standard mantle, his minimum price being 26s. per gross, but it was very difficult to sell at that price. In reply to the Chairman, he said that German mantles were sold at a little over 20s. per gross, and those from other countries were sold at lower prices.

Witness, replying to Sir John Barran, said that in very few cases did the user of the mantle get any advantage in price as between the British and the foreign mantle. The mantles which he sold to the wholesaler he had seen retailed at 4d. or 4½d., which was equivalent to about 54s. per gross, and the retail price of the German mantle, which came into this country at about 20s. a gross, was 4½d. He had also seen both British and foreign mantles retailed at 6d.

Mr. *Benjamin Bark* (Works Manager of the Welsbach Light Company, Ltd.) then gave evidence. Questioned by the Chairman as to wages in this country, he said that they were adjusted by the Joint Industrial Council, and rose or fell in accordance with a rise or fall in the cost of living. There was also a system, arranged by the Joint Industrial Council, by which manufacturers employed learners. He explained that, if they employed girls with no knowledge of the business, those girls were absolutely useless for a time. Therefore, they did not earn the full rate of pay until after a period of six months. The minimum rate of wage for girls of 18 years or over was 6½d. per hour, which, for a full week of 48 hours, made a total wage of 26s. There was no maximum wage; this depending upon the efficiency of the individual worker. About 60 p.ct. of the workers in the Welsbach factory were on piece rates, and 40 p.ct. on time rates; the piece rates being arranged in order to allow the efficient worker to earn 25 p.ct. above the time rates. Labour costs amounted to about 35 p.ct. of the total cost of production of the mantle. But labour also entered into the costs of the raw materials, and he estimated that, if the labour involved in the manufacture of the raw materials used by mantle manufacturers was also taken into account, the cost of labour represented about 60 or 70 p.ct. of the total cost.

Miss *M. Harwood* (Forewoman, Messrs. Joseph T. Robin, Ltd.) confirmed Mr. Bark's evidence as to the minimum time rates and the 48-hour week. In Messrs. Robin's Factory, about 70 p.ct. of the girls were on time work and about 30 p.ct. on piece work.

Mr. *C. H. Wilcox* (Traveller, Messrs. Lighting Trades, Ltd.) said he had had fourteen years' experience in selling mantles, and found competition more severe than before the war.

Questions were put by Sir John Barran as to the margin of profit made by the wholesaler and retailer as between British and foreign mantles, and witness replied that this was arranged by the retailer and wholesaler. The wholesaler sold according to the profit he wanted; but if he sold British and foreign mantles at the same price, then he obtained less profit on the British than on the foreign. There was competition among British manufacturers.

Replying to Mr. Aiton, witness said that a wholesaler was sometimes satisfied with a profit of 4s. per gross on foreign mantles, and therefore sold to the retailer at a price below that at which the British manufacturer could sell to the retailer direct. The difference between the wholesale prices of foreign and British mantles went to the wholesaler and retailer in varying proportions.

Asked whether a mantle was used until it lost its luminosity, or whether it was destroyed, witness said that, generally speaking, it was destroyed.

Mr. *H. Talbot* (General Manager, Welsbach Light Company, Ltd.) then gave evidence, additional to that which he had given *in camera* with regard to costs of production. Since his appointment as Manager of the Welsbach Company he had found it difficult to keep the Company's Wandsworth factory employed with orders for gas mantles, in consequence of the unfair foreign competition to which the business had been subject. The year ended March 31, 1925, was probably the most difficult that he had experienced, and especially the last five months of that year. While the duty on German mantles under Part II. of the Safeguarding of Industries Act was in full operation, and after the stocks of imported mantles had been exhausted, there was a slight temporary movement in the British mantle trade; but the duty was allowed to lapse when the trade were beginning to reap some slight benefit from the Act. Unfortunately, also, imports of mantles from other countries increased as the German import figures decreased. Mr. Talbot then gave information with regard to wages, prices of raw materials, &c., which he had obtained in Germany in February of this year. He had visited both Germany and Italy. Labour costs, he said, represented about 35 p.ct. of the total production cost of a mantle, starting with the mantle manufacturers' raw materials; but he would not like to make a guess at the moment as to what percentage of the total cost, including the manufacture of raw materials, was represented by labour.

Asked why the prices of raw materials were higher in this country than in Germany, he said that one factor was the lower labour costs in Germany; and if this applied to the mantle industry, it must apply to the industries which made the raw materials. It was pointed out by the Chairman that ramie yarn was the same price in England and Germany; and one of the things that occurred to Mr. Talbot, in explanation, was that the raw material used by the German and British ramie yarn manufacturers came from the same source. He had no knowledge as to whether the price was an arranged one. In the case of other raw materials—except gas, which was a trifle cheaper in England than in Germany—the prices were higher in this country than in Germany.

Asked what duty he would suggest should be imposed on German mantles, Mr. Talbot said that the German manufacturer was getting an advantage over the British manufacturer, as shown by his figures, of 10s. per gross. He suggested that this should be the amount of the flat rate on German mantles; and that the rate should be higher on mantles from other countries.

Mr. MACASKIE, in reply to questions by the Chairman, said he was going to question the suggestion that the rates of wages in foreign countries were as low as it was said they were. He was also going to suggest that the prices of raw materials in Germany and in this country, as given by the applicants, were not accurate.

Mr. *Soper* said the figures the applicants had given were the current prices in this country.

In adjourning the proceedings until June 4, the Chairman said he wanted to give Mr. Macaskie every opportunity to rebut the evidence put forward by the applicants.

As to a suggestion that the Committee should consider the conditions in Germany and Poland only, and not in Austria and Italy, in order to shorten the inquiry, Mr. Soper asked whether the opponents would admit that the wages and conditions of employment were worse in Austria and Italy than in Germany and Poland. If the opponents admitted this, and the Committee found that conditions in Germany and Poland were unfair, then it followed that conditions in Austria and Italy were also unfair. Mr. Macaskie intimated that he was willing that the matter should be decided on German and Polish competition; Italy and Austria manufactured only 1 p.ct. of the mantles sold in this country.

The Committee decided to rule-out countries other than Germany and Poland.

SOUTH AFRICAN LIGHTING ASSOCIATION, LTD.

Annual Meeting.

The Thirty-sixth Ordinary General Meeting of the shareholders of the South African Lighting Association was held at No. 90, Cannon Street, London, E.C., on Wednesday, May 27. Mr. WILLIAM CASH (the Chairman of the Association) presided.

The SECRETARY (Mr. William Cash, Jun.) having read the notice convening the meeting, the minutes of the last shareholders' meeting held on May 28, 1924, and the Auditor's report on the accounts for 1924,

The CHAIRMAN moved the adoption of the Directors' report and accounts for the year to Dec. 31, 1924. In doing so, he said that the year 1924 had been both a disappointing and a difficult one, both for the Directors in London and for the officers at Port Elizabeth and Grahamstown. The report really summed-up the position during the past year, and the reasons why the results were not so good as they had hoped. Dealing first with the position at Grahamstown, he said the results were pretty much what had been anticipated. The municipal electricity undertaking was opened there in the middle of 1924, and it was unavoidable, of course, that the business of the Association would be affected thereby. On the whole, the results were not worse than the Association might reasonably have expected, having regard to their experience at Port Elizabeth and elsewhere, when electricity was first introduced, and where previously gas had had a monopoly of lighting and heating. For the whole year the consumption of gas was down only by 18 p.ct., but in the second half-year the decrease was larger than this; in the September quarter the consumption was down about 33 p.ct., and in the December quarter 40 p.ct. One satisfactory feature was that comparatively few of the consumers had given up the use of gas. The Association had lost only about 9 or 10 p.ct. of the consumers; but the public lighting had gone over to electricity. The street lamps had been disconnected, and the Association had incurred a certain amount of expenditure in doing this, though part of the expenditure had been recovered from the municipality. It had affected the business in that the profits in the fittings department showed a drop of some £300. On the other hand, the Association's officers had done all they could to save expense. The repairs items were considerably less in respect of both the works and the meters. The staff had been reduced, and the officials at Grahamstown were doing all they could—not altogether unsuccessfully—in pushing the use of gas for both cooking and heating. The net cost of coal there had been somewhat less, and labour costs were also down. Summing-up the whole position, it would be seen that the drop in profits on the year was about £2480; but £1000 was accounted for by the difference in the profits at Grahamstown, which had been unavoidable. The most unsatisfactory part of the position there was the subsidizing of the electricity undertaking by the municipality. They were carrying it on at a loss—a substantial loss. He need hardly say that competition of this sort was very unfair; but the Association had no control over it, and so far as the losses incurred on the electricity undertaking had to be borne by the rates, there was the still more unfair result that the Corporation injured the Association's business and yet asked the Association to contribute to the stabilization of their undertaking. With regard to Port Elizabeth, the Directors were disturbed and dissatisfied with the state of affairs out there, and had asked Mr. W. Arnott (who was Manager there for a number of years) to pay a visit to South Africa. They had asked him particularly to go into the question of the heavy leakage which had occurred, and which had been mentioned at the shareholders' meetings both by himself (Mr. Cash) and his predecessor in the chair for a number of years. Mr. Arnott (who was present at the meeting) had devoted himself particularly to the distribution side of the business, and had conducted an overhaul of the mains. He had also taken steps to cut off a large number of the old services which it was thought might possibly account for the leakage, and he had gone into the question of the meters again. The effect of this had been that the expenditure on repairs of works, mains, and meters had been exceptionally high. Mr. Arnott had not found anything so seriously wrong as to account for the high leakage. Mr. J. Donaldson, who was Manager there, had returned home. The Association had appointed a new Manager, Mr. P. C. Cleasby, who had arrived at Port Elizabeth in March. He had told them that further expenditure was necessary on some of the plant at the works. Port Elizabeth was said to be the most progressive town in South Africa, and Mr. Cleasby said that he saw no reason why the Association's business there should not double in the next ten or fifteen years. With regard to the price of gas, it was evident to the Directors that, for the last two or three years, in view of the expenditure which had been necessary in order to catch up arrears of works which had arisen during the war, it had been too low. They had determined that from July next the price must be raised. The Directors, as was shown in the accounts, after consultation with the Auditor had started a renewal fund. The Association had built up out of profits over a long series of years a reserve fund of £27,000. They had been building up a special renewal fund to deal with repairs of retorts on a definite and fixed basis, and this had reached a reasonable figure to meet the expenditure on retorts which occurred at infrequent intervals; this expenditure being heavy because of the necessity for sending material and labour from this country. In addition, the Directors had transferred the sum of £7000 from the general reserve, and had christened it a "renewal fund." It was felt that if they were faced—as at the moment they were—with a certain expenditure of an exceptional character, it was only reasonable and wise to charge that definitely to a renewal fund which had been built up out of profits. Mr. Cleasby had reported that, if this business was going to grow, the time was approaching when it would be necessary to do some expensive repair work to the two smaller holders at Port Elizabeth. In addition, certain of the other plant would need attention. It would be unfair that the necessary expenditure should fall on any one year; and provision had been made for it in advance. With regard to the other figures for the year, repairs of works, mains, and meters had been very heavy—nearly £1000 more than it was a year ago. Coal had cost less. On the other hand, the year had been unsatisfactory in connection with tar. The municipality, which used to take the tar for roads, were now using different material. The Association, however, were trying to meet this difficulty by treating the tar. Again, in order to induce people to take fittings, the Association had cut prices to a certain extent, and profits under that head were not so good. The year had also borne the expense of Mr. Arnott's visit to Port Elizabeth. All these things had conspired together to make 1924 a poor year. On the other hand, he felt—and he believed the shareholders would agree with him when they had heard Mr. Arnott—that there was no need to be in the least despondent about the undertaking. During the year, at Grahamstown they had lost 90 consumers out of 1130; at Port Elizabeth the ordinary consumers had increased slightly. As to dividend, the Directors were only recommending 5 p.ct. this year. In this undertaking, however, there was an advantage arising from the refund of income-tax, and the income-tax for the year on the whole dividend would be 2s. 3½d. in the £, as compared with the ordinary English rate of 4s. 6d. in the £. Thus, while they were really paying 5 p.ct., or a net dividend of £4 8s. 6d. p.ct., if it were an English dividend, subject to income-tax at 4s. 6d. in the £, the net dividend would be £3 17s. 6d.; the 5 p.ct. paid by the Association was, therefore, the equivalent of an English distribution to the shareholders, not of 5 p.ct., but of 5¼ p.ct., which would give a net return of £4 9s. 2d. p.ct.

Another matter to which the Chairman referred was the alteration on the Board. Mr. Henry Woodall, a brother of the late Sir Corbet Woodall, had been a Director of the Association since 1901. His services had been of great value to the Association, but he had asked to be relieved of his duties because of the difficulty of travelling to and from London. In these circumstances, the Directors had felt that it would be advantageous to the Association if they asked his nephew, Mr. Henry Woodall, Jun., who was the son of the late Sir Corbet Woodall, to become a Director. He was Chairman of several large English gas undertakings, and he had erected the Association's works at Grahamstown, so that he knew something of South Africa. When his firm were engineers to the undertakings, he had been in constant touch with all that went on in South Africa, so that he did not come to the Board without knowledge of the undertaking. The Association had been very fortunate in having persuaded Mr. Woodall, Jun.—who was a very busy man—to join the Board.

Finally, the Chairman said that the Directors had had a rather anxious and worrying year, and had done all they possibly could. Mr. Jesse F. Scott (Consulting Engineer), who wrote every week to Port Elizabeth and Grahamstown, and received reports from there every week, had done all that was humanly possible to see that the works were carried on to the best advantage. The leakage question, which had troubled the Board exceedingly, was a mysterious matter. Night tests had been taken, the plant examined, and a lot of money spent on overhauling meters. He expressed the hope that in the current year they would reap some substantial advantage from Mr. Arnott's visit to South Africa.

Sir CHARLES J. JESSEL, Bart., seconded the adoption of the report and accounts.

Mr. WILLIAM ARNOTT, reporting upon his visit to the Cape, said that when he was there they had overhauled, tested, and cleared from naphthalene as many of the principal mains as was practically possible; most of the testing for leakage being done at midnight. Several cases of broken mains and leakage of gas had been found. They had also opened-out and cut-off all old and disused service pipes and mains, which in many cases were in very bad condition and leaking. Some of them had been laid many years, and had rusted away by the action of the soil. Over 600 services had been cut-off at the main; and this should show good results this year in reduced leakage. In Port Elizabeth there had been a remarkable change for the better, which impressed one after seven years' absence. The town had gone ahead, and all around there were signs of prosperity, as shown by the number of good-class houses erected. There was a great future before Port Elizabeth as a manufacturing town, and before the Association in the increased supply of gas for cooking, water heating, and heating for manufacturing processes, which would have to be met by more gasholder storage, and by extending and increasing the size of the mains. Gas must be more advertised, as was being done in England; and new business must be canvassed for. It was there for the seeking. With a greatly increased output of gas, which should naturally follow, the actual amount of leakage would not be increased, but the percentage would be very much reduced. The small output of gas at Port Elizabeth for the large area supplied and the long length of mains in use (some 45 miles or so) made the leakage high in percentage, though small per mile of main. Mr. Sterley (the Local Secretary at Port Elizabeth) and Mr. Hart (the Local Secretary at Grahamstown) were both very keen workers in the interests of the Association, and were ideal Secretaries. The Association were fortunate in having two such men in charge of the financial side of the business, which, he could testify from personal experience, could not be in better hands.

Mr. R. W. LONG asked if the amount put aside for the renewal fund was likely to be sufficient to meet the cost of all repairs, or whether there was likely to be a further charge on the revenue in the future.

Dr. E. C. CARTER, speaking of leakage of gas, said he was glad to hear that it was due to faulty mains, and not to any stealing on the part of customers.

Mr. ARNOTT said there was not a single case of this.

Dr. CARTER, referring to the Chairman's remarks as to competition with electricity at Grahamstown, said that the capital sunk in the works at Grahamstown was not more than one-third of that sunk in the Port Elizabeth Works. He asked whether there was a competing electricity undertaking at Port Elizabeth, and suggested that, if there were not, then the Association might undertake the supply of electricity as well as gas. It always seemed to him that a gas company was one of the most suitable undertakings for taking on the supply of electricity.

The CHAIRMAN pointed out that the Corporation were supplying electricity at Port Elizabeth.

Mr. HAYES asked if there had been an opportunity for checking the meters for a complete quarter since Mr. Arnott had carried out the alterations to the mains and services, and, if so, what the result had been.

The CHAIRMAN, replying to the questions asked, said that a report had been received from the Engineer, who put the total amount that might possibly be spent on overhauling everything he could think of at something rather less than the amount transferred to the renewal fund, so that it could be taken that the £7000 in that fund would cover everything. There was also the balance of the retort renewal fund, which was another £2300, so that they were amply covered. In fact, he did not know that it would be really necessary to spend anything like this amount. With regard to electrical competition, the Association had been through that experience at Port Elizabeth, where for a time they had lost a very large proportion of the gas consumption; but this had now been regained. Grahamstown, however, was not growing in the sense that Port Elizabeth was. It was a residential, and not a business, community; so that it might take longer to restore the old position there. He added that Dominion coal had been used, but Mr. Cleasby proposed to use a more expensive coal, and one which would give a better yield. All these matters were continually before the Directors.

Mr. HAYES asked what was the present price of gas.

The CHAIRMAN replied that it was 7s. 8d. net per 1000 c.ft. at Port Elizabeth (8s. 4d. per 1000 c.ft., less discount).

Mr. HAYES commented that this was very low.

The CHAIRMAN agreed that it was low for a Colonial town, and was the lowest in South Africa. It was considerably below the price at Cape Town, where there was a much larger undertaking, and one which was better situated than that at Port Elizabeth.

Mr. HAYES, referring to the increased demand foreshadowed by Mr. Arnott in Port Elizabeth, asked whether the existing works were capable of meeting that increase.

The CHAIRMAN said the increased demand would mean expenditure on holders, and possibly on purifying plant. On the question of leakage, he added that, curiously enough, Cape Town suffered from a very heavy leakage.

The report and accounts were adopted.

DECLARATION OF DIVIDEND.

The CHAIRMAN proposed that a dividend of 5 p.c. for the year, subject to income-tax on the final dividend (2 p.c.) of 5¾d. in the £, less the interim dividend already paid (3 p.c.), be declared. He pointed out that on the backs of the dividend warrants there was a most complicated calculation which the Inland Revenue authorities insisted upon being put on the documents. The rate of income-tax for the whole year would be 2s. 3¾d., and the rate on the final dividend was only 5¾d. It was a difficult calculation, but it was necessary to put it on the warrants, because of the question of reclaiming tax to those shareholders who were entitled to a reclaim.

Mr. T. N. G. JENNINGS seconded.

The resolution was carried.

RE-ELECTION OF MR. HENRY WOODALL, JUN.

The CHAIRMAN moved that Mr. Henry Woodall, Jun., be re-elected a Director of the Association.

Sir CHARLES J. JESSEL, Bart., seconded.

The resolution was carried.

Mr. HENRY WOODALL, returning thanks, said he had been connected with the Association for a great many years, and it was a real pleasure to come back and to do what he could to serve them.

On the proposition of Mr. R. W. LONG, seconded by Mr. HAYES, Mr. Percival D. Griffiths, F.C.A., was re-elected Auditor, at a remuneration of 40 guineas.

VOTES OF THANKS TO OFFICERS AND STAFF.

The CHAIRMAN moved a resolution of thanks to the officials at the Cape. Mr. Sterley (Local Secretary at Port Elizabeth), an old and valued servant, was still there; Mr. Cleasby (Manager) had recently begun his work; and Mr. Hart (Local Secretary at Grahamstown) was continuing to give the really valuable service he had given for a good many years.

Mr. F. R. SMITH seconded, and proposed a vote of thanks to the Board. He also expressed his appreciation of the foresight of the Board in getting Mr. Henry Woodall, Jun., to join. Mr. Woodall, with his great experience, would be a source of great strength, and they all looked forward to better times for the Association.

The votes of thanks were accorded with acclamation, and the proceedings terminated.

Gas Meter Testing at Glasgow.—In his report on the work of the Gas Meter Testing Department for the year 1924, Mr. S. B. Langlands says that the number of meters tested was 39,035, and the amount of fees collected £2276. Of the total number of meters tested, 38,202 were new and repaired meters, and 833 were sent in by gas consumers for certification as to correctness.

Wiessoe Foundry and Engineering Company, Ltd.—At the fifth annual meeting of the Company next Friday, the Directors will report a net profit for the year ended March 31 of £19,281. With the sum brought forward, there is £24,121 available for distribution, out of which the Directors will recommend the payment of a dividend of 10 p.c., free of income-tax. This will absorb £20,000.

Bombay Gas Company, Ltd.—An extraordinary general meeting of the Company was held on May 27—Mr. W. G. Bradshaw, C.B.E., in the chair—for the purpose of confirming as a special resolution the extraordinary resolution passed at the extraordinary general meeting held on April 29 (*ante* p. 384). The Secretary (Mr. A. Dickson, jun.) having read the notice convening the meeting, the Chairman moved: "That each of the existing £5 shares be divided into five fully-paid-up shares of £1 each." Mr. H. H. Macleod (Deputy Chairman) seconded the motion, which was unanimously agreed to. The proceedings then terminated.

MONTEVIDEO GAS AND DRY DOCK COMPANY, LTD.

A Satisfactory Report.

The Fifty-Third Ordinary General Meeting of the Company was held last Wednesday, at Dashwood House, Old Broad Street, E.C.—Mr. FRANK H. JONES in the chair.

The SECRETARY (Mr. Henry Kearns) read the notice convening the meeting; and the minutes of the last meeting were taken as read as also were the report of the Directors and the statement of accounts.

The CHAIRMAN said he had to apologize for the absence of Mr. Charles Hunt (the Chairman of the Company) who was away. He would ask the Secretary to read a speech which had been prepared by Mr. Hunt.

The SECRETARY thereupon read the speech, which was to the effect that at the last meeting it was unfortunately necessary to draw attention to the indifferent results obtained from the Dock and Workshops Department. For the year under review, it was, however, gratifying to be able to report that the turnover therefrom had increased by no less than £22,012, though, as stated in the report, the resulting profit had been a comparatively small one. On the other hand, in the Gas Department the progress had been substantial, both from the selling and production points of view. As regards production, the installation of further beds of retorts and coal handling machinery had now been completed, and the whole of the retort-house plant and other machinery had been made more efficient. Moreover, the purification plant had been increased, and the overhaul of the mains, and the substitution of larger pipes, was being continued. This had had the effect of increasing the capital expenditure by £21,012, and the capital account was now overspent by £3719. That this expenditure was necessary, and had been wisely made, was proved by the increase in gas sales of 8¼ p.c., while the number of consumers had increased by 6·38 p.c. This showed that the better supply of gas now obtainable, and the improved pressures at which they were able to deliver it, had brought about a larger average consumption; and it would have been still larger had they not been obliged to supply a very rich gas in order to keep the consumers satisfied in those districts where the mains had not yet been dealt with. While dealing with this question of capital, the shareholders would be interested to know that, if the bank would continue to accommodate them, the Board were hopeful of getting through this year without recourse to the issue of new capital. Stocks were £6076 higher than in the previous year. This arose chiefly from the value of cookers on hire, which were becoming increasingly popular; and the Directors had reason to believe that the efficient stoves the Company supplied to the public, their cleanliness and ease of control, and the large reduction of labour which they secured in the household, would encourage many more to adopt them. It was still the aim of the Board to give the City of Montevideo, which was increasing rapidly, a really efficient and reliable supply of gas, as they were sure that this was the best means of securing a still larger number of consumers each year, and that it would lead to the adoption by them of other gas apparatus, both for the home and for manufacturing and industrial purposes. The stock of pipes also showed a considerable increase, but it was their policy to keep the works fully supplied, so that the work of enlargement could be energetically pushed ahead. The stock of coal on Dec. 31 was smaller in quantity, and fortunately lower in average cost, than at December, 1923. A further satisfactory feature of the accounts was that, though exchange showed a loss of £12,394, it was nevertheless a reduction on the previous year of £6950. The remittances from Montevideo were £17,000 more; but the average rate was 45·42d. per dollar as compared with 41·38d. in the previous year, and as the rate of exchange was now about 48d., the loss this year—if this higher rate was maintained—would be sensibly reduced. Although the revenue had increased by £41,036, the expenditure has increased by £43,775—reduced by the smaller loss on exchange to £36,825. Part of this increased expenditure naturally followed through the payment of additional wages and the cost of extra materials due to the increased business in both the Gas and the Dock Departments. Further, they had charged in the year's accounts the balance of the cost of renewals in connection with the damage suffered from the severe storm in July, 1923; and there had also been heavier expenditure chargeable to repairs and maintenance, owing to the enlargement of the mains, part only of which could be treated as capital expenditure. However, the balance of revenue account, at £41,592, showed an increase of £4,206; and after providing £6494 for depreciation of capital accounts, and £1521 for depreciation of cookers on hire, they had been enabled to transfer £4500 to deferred maintenance, in which was included an amount towards the cost of the gasholder to be erected in the current year. They were commencing the shipment of the materials this month; and when the erection of the holder had been completed—which it was hoped would be in time for next year's winter season—the Board believed that the additional storage would tend to more economical working, and extend the life of the retorts, which at present had to be fired-up and let-down to suit the varying demands, which were very heavy at certain times of the day, and slight at others. The consequent wear and tear was therefore considerably more than if more regular working could be secured. It was not easy to forecast the results for the current year. So far this year the Dock Department, which was always a very fluctuating business, had secured a satisfactory share of the work to be executed, and had been fairly well employed. The number of gas consumers continued to increase, and a satisfactory number of additional cookers had been fitted each month. Residuals, which last year gave an excellent increase, compared with the year 1923, would, it was feared, not be so satisfactory. Coal was now being sold in Montevideo at very low prices. As the value of coke depended in a large measure upon the selling price of coal, the revenue obtained for this residual showed a reduction compared with the early months of 1924; but it was to be hoped that the competition would be less severe, and that coal would be sold at prices which yield a fair margin of profit. They could, of course, use their coke, and produce a larger quantity of water gas; and this would obviate throwing it upon the market at an unremunerative price. The plant

and property had been maintained in a very efficient condition; and the extension of the plant was sufficient to meet a considerable increase in output. With regard to their former General Manager, Mr. T. F. Lane, who was elected to the Board on his retirement, the Directors regretted that he had been obliged to relinquish his seat, as he had found it impossible to take up his permanent residence in this country. It was not proposed to fill this vacancy, but to carry on with four Directors as formerly; and the fees would be proportionately reduced.

The CHAIRMAN moved the adoption of the report and accounts; and this was seconded by Mr. JOHN MEWS, LL.D.

Mr. C. C. MALLET said he had recently had an opportunity of seeing the works; and what had struck him more particularly was that, owing to the advancement of Montevideo, the Company's freehold land possessed immense value. He reckoned the site alone was worth about two-thirds of the capital of the Company. He also desired to refer to the good work of the employees. He met Mr. J. N. Whyte (the Engineer and General Manager), Mr. J. S. Ryan (the Superintendent of the Dock Department), and Mr. D. C. Clark (the Engineer-in-Charge of the gas-works), and found them all most zealous in the Company's interests. The report was a very good one, in the circumstances which existed in the River Plate and in the gas industry.

Mr. HOWEL J. J. PRICE also congratulated the Board on the excellent character of the report and balance-sheet.

The report and accounts were unanimously adopted; and a dividend on the ordinary stock was declared, for the half-year to Dec. 31, of 2 p.ct., free of income-tax, making, with the interim dividend, 4 p.ct., free of income-tax, for the year.

Mr. John Mews was re-elected a Director, on the proposition of the CHAIRMAN, seconded by Mr. W. EDGAR HORNE; and the Auditors (Sir Laurence Halsey and Mr. William C. Sneath, partners in the firm of Messrs. Price, Waterhouse, & Co.) were re-appointed, on the motion of Mr. CLIFFORD H. HUNT.

The CHAIRMAN proposed that the best thanks of the meeting be given to the officers, staff, and workpeople, both here and in Montevideo. All did their very best for the Company.

This was seconded by Mr. MALLET, and acknowledged by Mr. KEARNS.

The proceedings concluded with a vote of thanks to the Chairman and Directors, which was proposed by Mr. PRICE, and seconded by Mr. HUNT. The mover voiced the regret of the shareholders at the absence of Mr. Charles Hunt.

WORTHING GAS COMPANY.

Special Order to be Applied For.

An extraordinary general meeting of the Worthing Gas Light and Coke Company was held on May 23 for the purpose of approving application for a Special Order, under section 10 of the Gas Regulation Act, to enable the Company, among other things, to extend their area of supply.

Mr. WILLIAM CASH (Chairman of Directors) said that the real object of the Order was to enable them to extend their area of supply. They had had in the past, on many occasions, requests to take a supply into the parish of Findon; but as this was beyond their statutory area, it was necessary for them to extend their area by a Special Order. As they were making this application, the Directors thought they would take the opportunity of bringing some of their regulations up to date, and slightly amending some of the provisions of the Act of Parliament of 1907, which were mainly administrative, in connection with the Company. The time by which local authorities could lodge objections to their application had not yet expired, but he did not think it likely that they would meet with serious opposition. The Chairman then proceeded to refer to the various clauses in the application, and in referring to that concerning the parish of Ferring, he pointed out that this parish was within the area of supply of the Littlehampton Gas Company, but they were not attempting to do anything inimical to the interests of the Littlehampton Company if they were prepared to give a supply. They had been asked to go there and give a supply to the parish. Mr. Cash also pointed out that they were seeking powers to raise additional capital. In regard to the price for supply at Findon, he said that for the first five years it was proposed to charge 2·4d. per therm above the price ruling for the time being at Worthing. They were seeking to be empowered to pay interim dividends. There was another clause dealing with pensions.

The CHAIRMAN then moved that approval be given to the application. The DEPUTY-CHAIRMAN seconded, and the motion was unanimously approved.

Visit to the Works of Messrs. Peebles & Co., Ltd.—Members of the Glasgow Corporation Lighting Association, to the number of 60, visited the works of Messrs. Peebles and Co., Ltd., Toy Works, Bonnington, Edinburgh, on Saturday, May 30, and made an exhaustive inspection of the manufacturing operations in connection with meters and gas governors. The visit proved of great interest, and was much appreciated. Mr. S. B. Langlands, Hon. President of the Association, and Inspector of Lighting for Glasgow, accompanied the party. After the visit the firm entertained the party to luncheon.

"S.B.G.I." Golf Challenge Bowl.—Fourteen members of the British Gas Industries Golfing Society took part in the competition at Sundridge Park on Tuesday, May 19, for the Yates Challenge Bowl, which was presented several years ago by Mr. H. James Yates (Chairman of Radiation, Ltd.). The winner was Mr. C. A. G. Thomas (E. & J. Pearson, Ltd., of Stourbridge). Mr. R. P. Chester was second, and Mr. H. M. Thornton (Director of Radiation, Ltd.) was third. One of the Past-Presidents of the Society, Sir Arthur Duckham, entered for the competition, but at the last moment was prevented from attending.

EASTBOURNE GAS COMPANY.

Proposals for raising additional capital in order to cope with increased business were submitted by the Directors of the Eastbourne Gas Company at an extraordinary general meeting of the stockholders, held on Thursday, May 21.

DIRECTORS' PROPOSALS

The following resolution was submitted:

"That the Directors be empowered to issue the remainder of the authorized capital (stock) amounting to £38,590 either as ordinary B stock or as 5 p.ct. preference stock, or partly as one of those stocks and partly as the other of them, and at such time or times and in such manner as the Directors shall deem best."

Also, "That the Directors be further empowered to issue the authorized loan capital (at present unissued) amounting to £79,167 as mortgage bonds, debentures, or 5 p.ct. debenture stock, or partly in one and partly in the other or others of those ways, and at such time or times and in such manner as they deem best."

The CHAIRMAN (Mr. Caleb Diplock) formally moved the resolution.

REASONS FOR FRESH CAPITAL.

The DEPUTY-CHAIRMAN (Mr. Frank H. Jones), after saying that he had much pleasure in seconding the resolution, explained the purpose of the meeting and the need for raising fresh capital. Parliament had said—and the Company could not act without such sanction—that the Company could raise £117,757—£38,590 as ordinary stock, and the balance as loan capital—and the Board were asking the stockholders to give them the necessary authority to do so. The Company had not raised any new capital for many years. When requiring money their practice had been to obtain loans from the bank, and at the present time they owed the bankers about £22,000. The balance-sheet for last year showed about £5500 invested in Consols in respect of the reserve and special purposes funds, and liabilities to those funds of just over £17,000. The Board had two things to do: First, to repay the money borrowed from the bank; and, secondly, to strengthen the reserve and special purposes funds by investing them, instead of sinking them entirely or largely in the undertaking itself. The money that came from this special appeal would therefore be used for the two purposes mentioned, and the investments in respect of the reserve and special purposes funds would be in first-class securities. More capital was naturally wanted in a fast-growing undertaking. To give them some idea of the extent of their business, he mentioned that gas was used in practically every house in Eastbourne—certainly in every house that the gas mains passed. The quantity of gas sold last year showed an increase of 6½ p.ct. on the previous year. This year, up to the present, that increase had been maintained. The strength and growing character of the business were further indicated by the showroom sales of stoves, cookers, fires, and lighting fixtures, which amounted last year to £12,000.

After the stockholders had given their sanction, they would receive an offer to subscribe £50,000 of 5 p.ct. debenture stock. The fact that the Eastbourne Gas Company had never had any loan capital was almost unique among gas companies.

The CHAIRMAN put the resolution to the meeting, and it was carried unanimously.

Blackburn Gas Undertaking.

The annual report of the Blackburn Gas Engineer, Mr. G. P. Mitchell, states that the total quantity of gas made during the year was 1004 million c.ft.—an increase of 55,565,000 c.ft., or 5·85 p.ct. over last year. The total number of gas cooking and heating appliances in use at the close of the year was 46,879, compared with 43,805 last year. The demand for these appliances, states Mr. Mitchell, has been maintained throughout the year. The total revenue was £291,204—a decrease of £0062, consequent upon a reduction of 3d. per 1000 c.ft. at the beginning of the year. The gross profit was £61,083, and the net profit £2486. An additional contribution of £1610 had been made for the extinction of the 4 p.ct. stock. The Engineer records that the demand for gas during the last six years has increased by approximately 270 million c.ft., or 36½ p.ct. The new showrooms in King William Street would shortly be ready for opening. The rateable value of the undertaking had been increased from £12,635 to £19,000, which would mean an additional payment to rates of £4050, equal to a charge of 1·05d. per 1000 c.ft. sold.

Lecture at Brighton.—At a meeting of the Brighton and Hove Rotary Club on May 27 Mr. C. H. Rutter, M.Inst.C.E., Engineer and General Manager of the Brighton and Hove General Gas Company, gave a lecture on "A Century of Gas Making," in which he dealt with the development of the industry and of the Brighton Gas undertaking, and gave a brief outline of the process of manufacture.

Charges for Gas Down to Pre-War Level.—At the last meeting of the Leek Urban Council reductions in the charges for gas to ordinary consumers were sanctioned—viz., "that as and from the date of the reading of the meters for the quarter ended March, 1925, the price of gas to ordinary consumers in Leek be reduced from 3s. 0d. to 3s. 6d. per 1000 c.ft., less a discount of 6d. per 1000 c.ft. for prompt payment; and that the price to ordinary consumers at Rudyard be reduced from 4s. 9d. to 4s. 6d., less a similar discount of 6d. Further, that the discount allowed to prepayment consumers in Leek be advanced from 5d. to 8d. per 1000 c.ft., and to prepayment consumers in Rudyard from 4d. to 7d. per 1000 c.ft." These revised charges for gas will bring it down to the pre-war level. Reviewing the year's working, the Chairman, Mr. N. A. Furmston, stated that considerable developments had been carried out at the gas-works, and the results had exceeded their expectations. The net loss on the year's working was about £1900; but this was largely due to the policy of spending as much as possible out of revenue and reserve fund, instead of borrowing at high rates of interest. On March 31 the reserve balance stood at £11,500.

TRADE NOTES.

Drakes' Verticals.

Messrs. Drakes, Ltd., of Halifax, in a folder bearing the title of "Vertical Retorts of Distinct Individuality," describe the main features in their form of setting. The folder is one of a series which the firm are issuing.

The "Becco-Legg" Measuring Gear.

A new list has been published by the Becco Engineering and Chemical Company, Ltd., of Nos. 158-160, City Road, London, E.C. 1, in which they describe the "Becco-Legg" plant "XL" water measuring and reagent apportioning gear, which is suitable for all makes of water softeners and purifiers using lime, lime and soda, chalk, alum, barium, carbonate, or other reagents.

"Talisman" Oils.

Messrs. Trier Brothers, Ltd., of No. 36, Victoria Street, Westminster, have published lists of their new "Talisman" oils for motor vehicle lubrication, collieries, and general industries, and their "T.B." grease cartridges. The firm claim that "Stauffer's Lubricant," of which they have been sole makers for more than forty years, represents the standard of excellence in grease lubrication.

New Plant at Blackburn.

The Blackburn Town Council have confirmed contracts with Messrs. R. & J. Dempster, Ltd., of Manchester, for the supply and erection of one four-lift spiral-guided gasholder, with steel tank, and one two-lift spiral-guided holder, with steel tank, at the Greenbank Gas-Works; and a carburetted water gas plant at the same works to be supplied and erected by Messrs. Humphreys and Glasgow, Ltd., of London.

Blackman Fans.

The higher the temperature in workshop, factory, mill, foundry, office, restaurant, theatre, or any other public building, the greater the necessity for Blackman ventilating fans, state the James Keith & Blackman Company, Ltd., of 27, Farringdon Street, E.C. 4, in an illustrated pamphlet which they have just issued. These fans keep the atmosphere clear and healthy, and blow in or induce a continuous supply of fresh air.

"Asbestone" Patterned Sheeting.

This widely known brand of asbestos-cement sheeting is now available with attractive patterns impressed for use as fire surrounds, &c. These sheets are of handsome appearance, and are substantial in thickness. They are easy to cut and fix, and can be coloured to tone with decorative schemes. The material does not leave the impression of ugly uniformity, but has slight irregularities in texture which afford a genuine tile effect—the more so when a transparent colouring is applied. Moreover, "Asbestone" patterned sheets are inexpensive; and numerous gas undertakings are fitting this material as an economic substitute for tiled and metal fire surrounds. The manufacturers, The Cellactite Works, Ltd., of Higham, Kent (London Office and Showrooms: Lincoln House, Nos. 296-302, High Holborn, W.C. 1), have published a booklet which describes this material, and which will doubtless be of interest to gas undertakings.

CONTRACTS OPEN.

Coal.

The Gas Committee of the Borough of East Retford are prepared to receive tenders for about 9000 tons of gas coal, nuts, peas, and slacks. [See advert. on p. 686.]

The Directors of the Peterborough Gas Company are inviting tenders for the supply of 16,000 tons of best screened gas nuts. [See advert. on p. 687.]

The Gas Committee of the Corporation of Belfast are requiring tenders for the supply of 170,000 tons of best gas coal. [See advert. on p. 687.]

Tenders are invited by the Audley Urban District Council for the supply of screened gas coal. [See advert. on p. 686.]

Steel Mains.

The Gas Department of the Pontypridd Urban District Council are inviting tenders for the supply and delivery of steel mains. [See advert. on p. 686.]

Tar.

Tenders are invited by the Lancaster Corporation for 300 tons of tar produced at their gas-works. [See advert. on p. 686.]

General Stores (Iron and Steel, Castings, Shovels, &c.).

The City of Leeds Gas Committee are inviting tenders for the supply of general stores and iron castings. [See advert. on p. 686.]

Pipes and Specials.

Tenders are invited by the Gas Committee of the Marple Urban District Council for the supply of gas mains and specials. [See advert. on p. 687.]

The Bradford Corporation gas showrooms, in Darley Street, have drawn large crowds lately to inspect a magnificent window display of prizes for competition at the annual Bradford Police Sports.

The Lytham St. Annes Council have referred back to the Committee a suggestion that gas should be reduced in price. The Engineer (Mr. J. H. Ranft) recommends that the present price of 10·8d. per therm be retained, but that a sliding-scale of discounts be adopted.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

The inland coal trade of Yorkshire and Lancashire is suspended owing to the holidays. Gas coal contracts should now be undergoing completion, but in many instances this cannot be done, most works preferring to carry on their obligations and to take coal purchased and not delivered. It is not expected that the gas coal market will be good until September or October.

There is still a deadlock in the shipping trade, particularly as far as Yorkshire is concerned. Collieries are being asked to quote for supplies from Sept. 1, but are reclining, and the market is dead.

There is a feeling that more industrial fuel will be required as from July 1 next; but nothing definite can be assumed either by colliery owners or consumers. Prices are ruling very low for "spot" market sales; but buyers are reluctant to take up any quality that may be available.

In Lancashire last wek a moderate amount of business was done in industrial fuel, and there was a fair demand for first-class Lancashire slacks.

The approximate prices at Hull for prompt loading f.o.b. usual shipping ports are: South Yorkshire—Association (hard), 19s. 6d.; screened gas coal, 17s. 6d. to 18s.; washed trebles, 18s. 6d. to 19s.; doubles, 16s. 6d. to 17s.; singles, 15s. 6d.; smalls, 11s. to 11s. 9d.; unwashed doubles, 16s.; rough slack, 10s. to 10s. 6d.; smithy peas, 18s. 6d. to 20s. West Yorkshire—Hartleys, 16s. 6d. to 18s.; screened gas coal, 16s. 6d. to 18s.; washed trebles, 17s.; doubles, 14s. to 15s.; singles, 13s. 6d. to 14s. 6d.; smalls, 11s.; unwashed trebles, 16s. to 16s. 6d.; doubles, 12s. to 13s.; rough slacks, 9s. 6d. to 10s.; coking smalls, 8s. 6d. to 9s. Derbyshire and Notts.—Top hards, 19s. 6d.; washed trebles, 17s. to 18s.; doubles, 16s. to 16s. 6d.; singles, 15s. to 15s. 6d.; smalls, 11s.; unwashed doubles, 14s. to 14s. 6d.; rough slack, 9s. 9d. to 10s. 6d.; gas coke, 19s. to 21s.; furnace coke, 15s. 9d. to 16s. 9d.; large screened steams for bunkers, 15s. to 17s. per ton.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

Notwithstanding the shrinkage of demand, the output of Midland pits was maintained at a fair average during May. Collieries are putting forth great efforts to keep pits going through the slack season, and are offering contractors very low terms conditionally on their taking "the fat and the lean" in equal weekly consignments. These offers apply to June and July. With the co-operation of the consumer the difficulties of autumn and winter supplies might be very considerably minimized. Current buying is mostly on hand-to-mouth lines, however, though stocks might now be laid in at a cost which would show a handsome saving when compared with those which in the nature of things must prevail later. The consumer will not understand that the effect of holding off the market is to cause stringency when the normal autumn demand sets in, and collieries must then balance the account by making use of a favourable market position for all it is worth. A Birmingham merchant who sent out 3000 circulars urging customers to place their orders during the summer and offering them the full advantage of lower pithead prices received no response whatever in the case of 2996 of them. The regular summer prices notified show reductions of 1s. to 2s. a ton on rates lately ruling; but consumers who are willing to facilitate business by taking convenient deliveries in bulk can get much larger concessions. There has been little work at the pits this week.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for May 27.]

Nos. 12,874-13,540.

(BADISCHE ANILIN- UND SODA-FABRIK).—"Purification of gases." No. 13,329.

CHANCE BROS. & CO., LTD.—"Apparatus for automatically exchanging incandescent gas mantles." No. 13,222.

COPPÉE ET CIE, E.—"Coke ovens." No. 13,455

CROSLAND, E. M.—"Cut-out device for burners for mixture of gas and air." No. 13,275.

EBERLEIN, J. B.—"Gas manufacture." No. 13,083.

HEYL, G. E.—"Distillation of oil shale, coal, &c." No. 13,418.

KNIGHT, H. S.—"Spirally-guided gasholders." No. 13,251.

RADIATION, LTD.—"Gas-heated water boilers." No. 13,531.

RUDE, J.—"Carbonization of fuel." No. 13,284.

SCOTT, J. W.—See Knight, H. S. No. 13,251.

SENSICLE, L. H.—"Manufacture of tar for road-making, &c." No. 13,263.

STEERE, F. W.—"Gas manufacture." No. 13,082.

STEERE, G. R.—See Eberlein, J. B. No. 13,083.

STOBART, H. J. S.—See Chance Bros. & Co., Ltd. No. 13,222.

SUFFERN, E. S.—"Generation of water gas." No. 13,254.

YATES, H. J.—See Radiation, Ltd. No. 13,531.

Sandy Gas Exhibition.—The Directors of the Sandy Gas Company recently held a gas exhibition, in conjunction with Messrs. R. & A. Main, Ltd., in the Conservative Hall, Sandy. Lectures and cookery demonstrations were given each afternoon and evening by Miss Anstice M. Strick, M.C.A. These attracted large and appreciative audiences. A representative selection of the manufactures of Messrs. R. & A. Main was arranged round the hall.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *May 29.*

The market for pitch is quiet; and although a certain amount of interest is being displayed in next season's shipment, the prices suggested by buyers are very low and not tempting to makers. The market is nominal at about 41s. to 42s. per ton.

The demand for road tar continues strong.

Creosote remains steady at about 7d. to 7⅛d. per gallon.

Solvent naphtha is firm at 1s. 8d. to 1s. 9d. per gallon for 95-160 quality. Pure benzole and pure toluole are about 1s. 11d. to 2s. per gallon.

Tar Products in the Provinces.

June 2.

There has been very little change in tar products during the past week.

In pitch there have been one or two sales reported for the forward position; but foreign buyers' ideas are lower than the tar distillers are generally willing to accept for the forward position.

Creosote is steady.

In water white products there is no change.

The average values for gas-works products during last week were: Gas-works coal-tar, 26s. 3d. to 31s. 3d. Pitch, East Coast, 40s. to 41s. f.o.b. West Coast—Manchester, 35s. to 36s.; Liverpool, 36s. to 37s.; Clyde, 39s. to 40s.; Benzole, 90 p.c., North, 1s. 7¼d. to 1s. 8¼d.; crude, 65 p.c.t. at 120° C., 11d. to 1s. 1d., naked at makers' works; 50-90 p.c.t., naked, North, 1s. 7¼d. to 1s. 8¼d. Toluole, naked, North, 1s. 6½d. to 1s. 7¼d., nominal. Coal-tar crude naphtha, in bulk, North, 7¼d. to 8¼d. Solvent naphtha, naked, North, 1s. 5d. to 1s. 6d. Heavy naphtha, North, 1s. to 1s. 2d. Creosote, in bulk, North, liquid, 5⅜d. to 6d.; salty, 5⅛d. to 5⅜d.; Scotland, 5¼d. to 5⅜d. Heavy oils, in bulk, North, 6¼d. to 7d. Carbolic acid, 1s. 5d. to 1s. 6d. prompt. Naphthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.c.t., purely nominal; "B" unsaleable.

BRITISH SULPHATE OF AMMONIA FEDERATION PRICES.

The British Sulphate of Ammonia Federation, Ltd., in announcing their prices for the 1925-26 season, write:

"You will observe that, in spite of the heavy reduction in price which we have decided to make, though there has been no material decrease in the price of our chief raw material, sulphuric acid, nor in our other costs of production, we have made no alteration in the amount of the commission allowed to recognized distributors. We have refrained from reducing the commission because we are anxious not to do anything which might hamper the distribution, and therefore discourage the use, of sulphate of ammonia at a time when agriculture is but slowly recovering from an acute crisis, and while British consumption of fertilizers generally is still far below the level already reached by progressive agricultural communities in other countries. It is understood that quantities purchased at the price stated below will be used for home agricultural purposes only. Prices for later months will be announced later; but we are prepared to quote for forward delivery now on application.

"We offer to sell sulphate of ammonia for home agricultural use at the following prices: For June, July, and August delivery, £12 5s. per ton for neutral quality in fine friable condition, free from lumps, basis 21·1 p.ct. nitrogen. Delivered to consumer's nearest station or wharf in Great Britain, for prompt cash payment, in lots of four tons and upwards."

Lea Bridge Capital Issue.—The £30,000 of 6 p.ct. preference stock of the Lea Bridge District Gas Company issued by Messrs. A. & W. Richards, on behalf of the Directors, was considerably oversubscribed at prices ranging from £107 down to the minimum of par.

Price of Gas at Truro.—The Truro Mercantile Association have decided to ask the Truro Gas Company to consider the matter of reducing the price of gas. Mr. J. H. Broach, who introduced the question, said they were at present paying 1s. 4d. per therm, which was equal to 6s. per 1000 c.ft.

Gas Mantles Committee.—The Committee appointed by the President of the Board of Trade to inquire into, and report upon, the application made by the Incandescent Mantle Manufacturers' Association for the imposition of a duty upon gas mantles, will hold a further public sitting for the purpose of taking evidence at 10 a.m. on Thursday, June 4, at the Board of Trade, Great George Street, S.W. 1.

Increased Price at Coventry.—The Coventry Corporation have decided to increase the price of gas by 3d. per 1000 c.ft. to prepayment meter consumers and 4d. per 1000 c.ft. to ordinary consumers. Bulk consumers above 7,500,000 c.ft. per quarter are to pay an increase of 3d. per 1000 c.ft. The reasons given for raising the price are an estimated deficiency of £19,800 on the year's working, owing to increased wages and the decrease in the value of tar products and the slump in the market for gas coke.

Padiham Gas Undertaking.—The Padiham Urban District Council have received a letter from the Ministry of Health requesting to be furnished with the Council's observations on the Assistant Auditor's report on the gas-works finances, and stating that the Ministry, in the present instance, in view of the financial position of the undertaking, would be prepared to entertain an application for sanction to borrow money in respect of the completed works. The Council, however, decided that they did not consider it desirable that the money should be borrowed; and the Clerk was instructed to reply to the Ministry accordingly.

Issue of 5 per Cent. Debenture Stock.

THE

EASTBOURNE GAS COMPANY.

(Incorporated by Special Act of Parliament 1868.)

DIRECTORS:
MR. CALEB DIPLOCK (*Chairman*).
MR. FRANK H. JONES, C.E. (*Deputy-Chairman*).
MR. BENJAMIN BRADFORD.
MR. HOWEL J. J. PRICE, D.L., J.P.
MR. CLEMENT JOHN VINALL.
MR. F. ELIOT WILLIAMS, O.B.E.

RESIDENT ENGINEER AND WORKS MANAGER:
MR. WILLIAM H. HAMMOND.

SECRETARY: MR. JAMES S. GARRARD, F.C.I.S.

AUDITORS: MESSRS. JAMES WORLEY & SONS, Chartered Accountants, London and Eastbourne.

BANKERS: BARCLAYS BANK LIMITED.

THE DIRECTORS OFFER FOR SALE BY TENDER

£50,000

5 per Cent. DEBENTURE STOCK.

The Minimum Price at which Tenders will be received is £95 per cent.

A deposit of £10 per £100 must accompany a tender, and the balance of the purchase money is to be paid by 30th June, 1925.

The Stock will carry Interest from the 1st July, 1925, and will be payable half yearly on the 1st January and 1st July.

The Stock will be registered in the Company's books and the certificates issued in the names of the purchasers or their nominees free of expense.

The Company has been incorporated for nearly 60 years, and its powers have been added to from time to time by successive Acts of Parliament, and, more recently, by Orders under the Gas Regulation Act, 1920.

The Statutory area now covers not only Eastbourne, but extends to the market town of Hailsham, together with Hellingly, Horsebridge, Westham, Hankham, Pevensey Bay, Willingdon, Wannock, Jevington, East Dean, and Polegate.

This growth of the Company's operations has necessitated considerable works extensions and the laying of many miles of mains.

The following Table indicates the Growth of the concern:

Year.	Number of Gas Consumers.	Gas Sold, Millions.
1904	7,345	353
1909	9,423	449
1914	11,365	511
1919	11,957	528
1924	13,371	555

The Authorized Capital of the Company is	**£364,000**	**0**	**0**
Of which there has been issued	325,409	11	2
Remaining to be issued	£38,590	8	10
The Authorized Loan Capital is	**£79,167**	**0**	**0**

These powers have not hitherto been used; this is the first issue of Loan Capital.

As is generally known, this Company enjoys the reputation of working upon a very low Capital; and consequently occupies a strong position financially.

This additional Capital will still leave the Company in an enviable position with respect to the amount of Capital employed as compared with similar Companies.

The Reserve and Special Purposes Funds of the Company amount to £17,114.

The amount at Credit of Profit and Loss Account is £15,834, after payment of the half-yearly dividend on the 6th March last.

Tenders for the Stock must be sent in not later than Monday, 8th June, 1925, and in the event of the receipt of Tenders for a nominal amount of Stock exceeding £50,000, Tenders at the lowest price accepted will, as far as possible, be subject to a *pro rata* diminution.

If no allotment is made, the deposit will be returned in full, and in case of partial allotment, the balance of the deposit will be applied towards payment of the remainder of the purchase money.

The Stock will be registered, and will be transferable by deed in the usual way in amounts or multiples of £50, as soon as it is fully paid.

Interest at 10 per cent. per annum will be charged on balances not paid on the due date (30th June, 1925).

Application will be made in due course to the Committee of the Stock Exchange to allow dealings in the Stock now being issued.

Copies of this Prospectus and Forms of Tender may be obtained at the Company's Offices, 87, Terminus Road, Eastbourne.

By Order of the Board of Directors,
CALEB DIPLOCK,
Chairman.

87, Terminus Road, Eastbourne,
1st June, 1925.

Tenders to be forwarded to the Secretary, Eastbourne Gas Company, in a sealed envelope marked "Tender for Debenture Stock," not later than Monday, 8th June, 1925.

The minimum amount of Stock which may be tendered for, or will be allotted, is £50 or multiples thereof.

The Stock will be registered in the Company's Books, and the Certificates issued in the name of the allottee or his or her nominee, free of all expense.

STOCK MARKET REPORT.

Ignoring the allurements of the Derby and the excitement over the Stock Exchange sweepstake, the chief feature of the Stock Markets last week was the failure of the 5 p.ct. New South Wales Loan. As we indicated last week, the more generous terms, as compared with the two previous large issues of trustee securities, were expected to attract investors, and the result, which left 68 p.ct. with the underwriters, is difficult to understand. It would be gratifying if it were clear that the monies are being used for trade expansion. Reports from industrial centres, however, though hopeful, do not appear to justify this interpretation, as the poor response is not confined to trustee securities; the underwriters of the ordinary and preference shares of Henry G. Lewis & Co. being left with about 80 p.ct. of the issue. Dealings in the new loan were recorded at $\frac{5}{16}$ discount. Some hopes are expressed of improvement in prices this week on the distribution and investment of the War Loan dividend, and the Gilt-Edged Market was steady in consequence.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. May 29.	Rise + or Fall − on Week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 5	5	5	Aldershot 5 p.c. max. C.	78–81	..	..
295,492	,,	,,	4	4	Do. 4 p.c. Pref.	71–76	..	..
1,351,868	,,	Apl. 2	6½	6½	Alliance & Dublin Ord.	65–70	..	..
374,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb.	63–68	..	..
300,000	5	May 7	8	8	Bombay, Ltd.	4⅞–5⅛	..	5⅛
170,000	10	Mar. 5	8½	8½	Bournemouth 5 p.c.	12–13	..	..
425,050	10	,,	7	7	Do. B 7 p.c..	12½–12⅝	..	12⅛
150,000	10	,,	6	6	Do. Pref. 6 p.c..	11–12	..	11⅛–11⅞
50,000	Stk.	Jan. 8	3	3	Do. 3 p.c. Deb.	56–59	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb..	78–81	..	..
992,045	,,	Mar. 5	6⅛	6⅛	Brentford A Con.	95–100	..	95–97
990,500	,,	,,	6½	6½	Do. B New	95–100	..	96
76,000	,,	,,	5	5	Do. 5 p.c. Pref.	95–98	..	..
306,690	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	76–81	..	..
281,337	,,	,,	6	6	Do. 6 p.c. Rich. Red. Deb.	100–105	..	..
214,740	,,	Mar. 5	11½	12½	Brighton & Hove Orig.	165–170	..	..
244,200	,,	,,	8½	9½	Do. A Ord.	122–125	..	..
1,287,500	,,	Feb. 19	4	5	Bristol 5 p.c. max.	96¾–97¼*a*	..	..
855,000	,,	Mar. 19	8	7	British Ord.	110–115	..	..
100,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref.	123–128	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	72–77	..	..
100,000	10	May 21	6	8	Cape Town, Ltd.	6¼–7⅜*	..	..
100,000	10	Apl. 23	4½	4½	Do. 4½ p.c. Pref..	6–7	..	..
150,000	Stk.	Dec. 18	4½	4½	Do. 4½ p.c. Deb..	71–76	..	..
626,860	,,	Feb. 19	6	6	Cardiff Con. Ord.	101–104	..	..
237,860	,,	Jan. 8	7½	7½	Do. 7½ p.c. Red. Deb.	104–107	..	..
157,150	,,	Feb. 19	5	6½	Chester 5 p.c. Ord.	89½–94½*b*	..	..
1,513,280	,,	Mar. 5	6	5/14/8	Commercial 4 p.c. Cap.	86–89	..	86–88
560,000	,,	,,	6	5⅝	Do. 3½ p.c. Cap.	86–89	..	..
475,000	,,	Dec. 18	3	3	Do. 3 p.c. Deb.	57–60	..	..
800,000	,,	14 Jan. 15	—	—	Continental Union, Ltd.	35–40	..	35⅛–36
200,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref.	88–92	..	91½
660,000	,,	Mar. 5	6½	6½	Croydon sliding scale	98–102	..	99½–100⅛
284,975	,,	,,	5	5	Do. max. div.	83–86	..	83½
492,270	,,	Feb. 19	6	9	Derby Con.	110–112*c*	..	..
55,000	,,	Jan. 8	4	4	Do. Deb.	74–76*c*	..	..
1,002,180	I	Jan. 22	6	4	European, Ltd.	7–8	..	7–7½
16,460,070	Stk	Feb. 19	5⅓	5⅓	Gas Light & Coke 4 p.c. Ord.	83–85	..	83¼–84¼
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	62–65	..	63–64
4,062,235	,,	,,	4	4	Do. 4 p.c. Con. Pref.	78–80	..	79½–80
4,761,930	,,	Dec. 18	3	3	Do. 3 p.c. Con. Deb.	59–62	..	60⅜–61⅜
130,000	,,	—	10	10	Do. 10 p.c. Bonds	..	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Mar. 19	6½	6½	Hastings & St. L. 5 p.c. Conv.	92–97	..	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	73–78	..	75⅛–75⅞
70,000	10	May 7	10	10	Hongkong & China, Ltd.	15⅜–16½	..	..
86,600	Stk.	Mar. 5	10	10	Hornsey 7 p.c.	136–141	..	..
1,976,000	,,	May 21	10	59	Imperial Continental Cap.	150–155*	−3	151–155
263,950	,,	Feb. 5	3½	3½	Do. 3½ p.c. Red. Deb.	71–74	..	..
235,242	,,	Mar. 19	6½	6½	Lea Bridge 5 p.c. Ord.	96–101	..	..
2,127,340	,,	Feb. 19	5⅛	5⅛	Liverpool 5 p.c. Ord.	88⅛–89⅜*b*	−½	..
600,000	,,	Mar. 19	7	7	Do. 5 p.c. Pref.	103–104½*b*	..	..
165,736	,,	Feb. 19	9	8	Maidstone 5 p.c. Cap.	122–132	..	..
63,480	,,	Dec. 18	3	3	Do. 3 p.c. Deb.	53–58	..	..
75,000	5	Dec. 4	7	5	Malta & Mediterranean	4½–4¾	..	..
541,920	Stk.	Nov. 20	4	4	Montevideo, Ltd.	66–70	..	67½–68
2,061,315	,,	Mar. 5	5	5	Newcastle & Gateshead Con.	77⅛–78*d*	..	..
300,929	,,	,,	4	4	Do. 4 p.c. Pref.	76–77*d*	+3	..
529,705	,,	Dec. 18	3½	3½	Do. 3½ p.c. Deb.	68½–69½*d*	..	..
15,000	,,	Mar. 5	11	12	North Middlesex 10 p.c.	..	..	..
75,940	,,	,,	7⅞	8⅜	Do. 7 p.c.	..	..	..
300,000	Stk.	May 7	9	7	Oriental, Ltd.	100–105	..	104½–105
188,120	,,	Jan. 8	7¼	7¼	Plym'th & Ston'house 5 p.c.	109–114	..	..
60,000	50	Mar. 5	13	14	Portsea Island B	96–99	..	..
100,000	50	,,	12	13	Do. C	93–98	..	..
2,289,900	100	,,	I	—	Primitiva Ord.	9/6–10/6	+–/6	9/–10/–
311,100	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb..	79–81	..	..
600,000	Stk.	Jan. 22	4	4	Do. 4 p.c. Red. Deb. 1911	76–76	..	65⅜
220,335	,,	Dec. 18	4	4	Do. B. Aires 4 p.c. Rd. Db.	65–67	..	..
321,670	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	65–67	..	..
150,000	10	Mar. 19	6	6	San Paulo 6 p.c. Pref.	7⅞–8⅛	..	8⅛–8¼
125,000	50	Jan. 2	5	5	Do. 5 p.c. Red. Deb.	43–46	..	..
270,000	Stk.	Mar. 19	5⅛	5⅛	Sheffield A	103–105*e*	..	..
419,968	,,	,,	5⅛	5⅛	Do. B	103–105*e*	..	..
1,047,000	,,	,,	5⅛	5⅛	Do. C	103–105*e*	..	..
90,000	10	Oct. 23	8	6	South Met. Ord.	7–9	..	..
6,609,895	Stk.	Feb. 19	5	6¼	South Met. Ord.	93–95	..	93¼–94⅛
1,895,445	,,	Jan. 8	3	3	Do. 3 p.c. Deb.	59–62	..	60⅛
734,000	,,	Mar. 5	6¼	6¼	Do. 6¼ p.c. Red. Deb.	102½–104⅛	..	104
91,500	,,	Mar. 5	8½	8½	South Shields Con.	135–136*d*	..	..
1,187,795	,,	Feb. 19	6¼	6¼	South Suburban Ord. 5 p.c.	95–98	..	96
368,837	,,	Dec. 18	5	5	Do. 5 p.c. Deb.	97–100	..	..
647,740	,,	Mar. 5	5	5	South'mpt'n Ord. 5 p.c. max.	81–84	..	..
121,275	,,	Dec. 18	4	4	Do. 4 p.c. Red. Deb.	74–77	..	..
250,000	,,	Mar. 5	7	7	Swansea 7 p.c. Red. Pref.	102–104	..	..
200,000	,,	Dec. 18	6¼	6¼	Do. 6¼ p.c. Red. Deb..	103–105	..	..
120,000	,,	Feb. 19	8	8	Tottenham District A 5 p.c.	116–119	..	..
882,275	,,	,,	6¼	6¼	Do. B 3½ p.c.	95–98	..	95
150,000	,,	—	—	—	Do. 5½ p.c. Pref.	103–105	..	104½
181,255	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	77–80	..	..
258,251	,,	Mar. 19	5	5	Tynemouth Con. and New	74–76*d*	..	..
107,294	,,	Feb. 19	6¼	6¼	Uxbridge, Maidenhead, & Wycombe 5 p.c.	95–100	..	..
88,330	,,	,,	5	5	Do. 5 p.c. pref.	95–100	..	..
91,800	,,	,,	—	6¼	Do. 5 p.c. Maidenh'd	90–95	..	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Mar. 5	9¼	9¼	Wandsworth A 5 p.c.	130–135	..	..
255,636	,,	,,	7⅞	7⅞	Do. B 3½ p.c.	110–115	..	112⅛–113⅛
392,955	,,	,,	6/9/6	6/9/6	Do. C and New	95–100	..	..
352,000	,,	,,	7⅜	7⅜	Wimbledon 5 p.c.	105–110	..	..
98,000	,,	,,	7⅛	7⅛	Epsom 5 p.c.	112–117	..	..
88,416	,,	Dec. 18	3	3	3 p.c. Deb.	57–60	..	..

Quotations at :—*a*,—Bristol, *b*,—Liverpool, *c*,—Nottingham, *d*,—Newcastle, *e*,—Sheffield. * Ex. div.

In the Foreign Market German 7 p.ct. were marked up ¼ to par, and French Bonds were a little better. Home Rails continued a friendless market. There were some uncertain movements in the Oil Market, which will not be improved by the rumours in certain quarters of a possible reduction shortly in the price of both crude oil and petrol. Rubber shares, due to a further improvement of the raw material, which now stands at 2s. 10¾d. per lb., were buoyant, and several appreciable increases occurred in the quotations.

The Gas Market was quieter than usual. There were fewer transactions recorded, and the only quotations varied on the London Exchange were a further fall of 3 points on Imperial Continental Ordinary, and a rise of 6d. on the Primitiva Ordinary. An addition to the List is made this week by the inclusion of the Tottenham and District £150,000 5½ p.ct. Preference Stock.

The following transactions were recorded during the week:

On Monday, Bombay 5⅛, Bournemouth "B" 12⅛, Brentford "A" 96, Commercial 4 p.ct. 88, Continental Union 36, European 7, 7⅛, Gas Light and Coke 83⅞, 84¼, 4 p.ct. preference 79¾, 80, 3 p.ct. debenture 61¼, 61½, Imperial Continental 154⅛, 155 *ex* div., Montevideo 67½, Primitiva 4 p.ct. debenture (1911) 65½, South Metropolitan 3 p.ct. debenture 60½, Tottenham "B" 95.

On Tuesday, Bournemouth "B" 12⅛, Commercial 4 p.ct. 87, Croydon maximum dividend 83½, Gas Light and Coke 83⅛, 84⅛, 84¼, 3½ p.ct. maximum 64, 4 p.ct. preference 79½, 3 p.ct. debenture 60⅜, 61, Imperial Continental 154 *ex* div., Montevideo 68, Primitiva 9s. 7¾d., 9s. 9d., San Paulo 6 p.ct. preference 8⅛, 8⅛, South Metropolitan 6¼ p.ct. debenture 104. Supplementary prices, Hornsey 4 p.ct. debenture 75, Montevideo 5 p.ct. 1st mortgage debenture 75.

On Wednesday, Bournemouth "B" 12½, 12⅛, 6 p.ct. preference 11½, 11⅝, Brentford "A" 97, Continental Union 7 p.ct. preference 91½, Gas Light and Coke 83½, 83⅜, Imperial Continental 154 *ex* div., Oriental 104½, 105, Primitiva 9s. 6d., 9s. 7¾d., 9s. 9d., South Metropolitan 93⅛, 94¼, 94½, 6¼ p.ct. debenture 104, Wandsworth "B" 113¼.

On Thursday, Brentford "A" 95¾, "B" 96, Commercial 4 p.ct. 87, Continental Union 35¼, Croydon sliding-scale 99½, 99⅞, 100⅛, Gas Light and Coke 83⅛, 83⅜, 84, 84¼, Imperial Continental 153, 155 *ex* div., Primitiva 9s., 9s. 4½d., 9s. 9d., 9s. 10½d., 10s., South Metropolitan 93⅜, 94⅛, Tottenham 5⅛ p.ct. preference 104¼, Wandsworth "B" 112½. Supplementary prices, Hornsey 4 p.ct. debenture 76½.

On Friday, Commercial 4 p.ct. 86, Croydon sliding-scale 99¼, 99⅝, 100⅛, Gas Light and Coke 84⅞, 84¼, 3½ p.ct. maximum 63, 63⅜, 63⅞, Hastings and St. Leonards 3½ p.ct. 75¼, 75⅜, Imperial Continental 151, 152, 153, 154 *ex* div., South Metropolitan 93¾, 94⅛, South Suburban 96.

In Lombard Street money was considerably easier, and a further general decline occurred in both loan and discount rates. The charge for renewing day-to-day loans after touching 4½ p.ct. finally closed at 4 and 3½ p.ct. The Treasury Bill average rate dropped a little over 3s. 1d. on the week to £4 6s. 4'48d. p.ct.

In the Foreign Exchange Market French francs were erratic, and at one time touched 97.45, finally closing at 96.90. Belgian exchanges as usual rose in sympathy, and closed at 99.25. Italian lire, on the other hand, appreciated slightly, and closed on Friday at 121.69. Sterling was generally firm; and on Thursday touched the highest price since the war. The week closed at 4.86⅛.

Silver was firm on Indian support at 31⅜d. per oz. There was no gold available, the price nominally being 84s. 11½d. per oz.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on March 5. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3½ p.ct. at notice.

Demy 4to. Limp Cloth. Price 10s. 6d.

THE FLOW OF GASES and PROPORTIONING GAS MAINS.

By

F. SOUTHWELL CRIPPS, Assoc.M.Inst.C.E.

WALTER KING, Ltd., "Gas Journal" Offices, No. 11, Bolt Court, Fleet Street, E.C.4.

GAS JOURNAL

LIGHT · HEAT · POWER · BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

PROPRIETORS: WALTER KING, LIMITED. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

Telephone: Central 6055. —— Telegrams: "GASKING, FLEET, LONDON."

VOL. CLXX., No. 3239.] WEDNESDAY, JUNE 10, 1925. [77TH YEAR.

INSTITUTION MEETING

A complete account of the week's proceedings will appear in the single issue of the "JOURNAL" published on June 17.

EDITORIAL NOTES.

The Institution Meeting.

gorgeous weather similar to that experienced last eek favours the present one, nothing will be wanting complete the success of the annual meeting of the In- itution. The programme is a full one; and the records headquarters show that the members are entering thusiastically into every item. From beginning to end, e predict (given good weather) complete satisfaction on e part of all who will be taking part in the week's events. here is one matter to which reference may be made. rough the stress of the times and the many occupations our busy men, the MS. of some of the reports and pers which are being presented at the meeting was mewhat belated; and then the intervention of the Whit- n holidays caused further delay to the work of revision d printing. It is not the fault of any one connected with e Council or headquarters that the reports and papers re not available in time for a studied examination by embers of their contents well before the meeting. evertheless, it is a pity; and this may detract somewhat om the value of the discussions. But the programme is substantial one; and therefore, although there are to be o afternoon sittings, it will be an advantage if speakers frain from being discursive and avoid generalities. ie maximum result from the time at disposal is what is quired.

As this issue of the "JOURNAL" is being prepared for ess, considerable interest is being recorded in the Great all at the Institution of Civil Engineers. There has been e welcome to distinguished visitors, and to delegates om overseas. There have been the presentation of edals and diplomas for valuable work and successful ort. A sum of £100, we are pleased to note, has been ted by the Institution as a donation to the Lord Moulton emorial Fund; and worthy additions have been made the list of distinguished men who are honorary mem- rs of the Institution. We have had the address of the esident (Mr. J. Ferguson Bell, M.Inst.C.E.), who has orked with characteristic energy to leave nothing undone hich could be done to make the meeting of 1925 perfect every detail. As we close our preparations for this ue, the reports of the various Committees are being ten in hand.

There is a point concerning the visit to Derby. One the items in the programme for the day's arrangements s tea at Haddon Hall—the famous seat of the Duke of tland. Our readers will have read with regret of the structive fire in the tea rooms at the Hall. The Presi- nt tells us this will need a modification in the plans, t only a slight one; and on the occasion each visitor ll receive a printed slip giving full particulars of the cessary change.

A complete report of the proceedings at the meetings, gether with descriptive accounts of the visits and the ctions, will appear in the next issue of the "JOURNAL."

Mr. Banbury Ball and Compulsory Electricity Patronage.

It is not every man who is in the position, or would have the courage, to take, in similar circumstances, such a step as has Mr. T. Banbury Ball, the much-respected Engineer and Manager of the Rochdale Corporation Gas-Works. Some electrical people will say he has resigned his office in a fit of pique; those of us who know him intimately, and have great regard for the fine conscientiousness which animates him in all things, will know full well that, when he says the course he has taken is a protest against an ill-advised piece of policy on the part of the Corporation Gas and Electricity Committee, this is the whole truth of the matter. He has given to the Corporation forty-four years' distinguished and loyal service; the act of the Committee which has led to the relinquishing of office, as from August 4 next (which will be the anniversary of the commencement of the long service), shows that such fealty does not count for much with the Committee. The resignation is due to their decision—come to behind Mr. Ball's back, and without any consultation whatever with him—to provide only electricity (instead of the dual services) in sixty-six Corporation houses which are being erected on the Kilworth Street site. While courtesy alone to their old adviser and official should have prevented this secret proceeding, the fact itself suggests that the Committee deliberately wished to take the course they did without his knowledge. The proceeding is so unusual, so out of harmony with considerate and circumspect administration, that the strongest possible protest against it is justifiable. In his letter of resignation (quoted in a later column), Mr. Ball states that no intimation was given to him that the question was under consideration; that he had therefore no opportunity of expressing his views on the matter; and that he is firmly of opinion the tenants of the houses should be free to exercise their own views on the subject. With Mr. Ball's action, there will be both sympathy and endorsement throughout the gas industry.

The incident raises the general question of policy in this matter. Where a Corporation owns, as representatives of the ratepayers, both the gas and electricity undertakings, the ratepayers do not expect that their representatives shall despotically decide for them which form of lighting, heating, and cooking they shall patronize. Things are coming to a pretty pass when, as at Rochdale, these things happen. It is bad enough when a municipality owns an electricity undertaking, and private enterprise has been supplying a town with gas perhaps for the best part of a century, for the Corporation to insist (when they ignorantly think they have the power) upon curtailing the liberties of the people by compelling them to give their custom—not on account of economic merit—to the municipal electricity concern. Even where ownership conditions of that kind exist, Parliament do not look with favour upon such assumption of autocratic power. Their preference is for "free trade" among competing local undertakings or businesses. We cannot

understand business men in any town tolerating the introduction into municipal policy of deprivation of anyone of freedom in the placing of custom. It is a bad principle; and the sooner it is ended the better. One thing it shows is that, having freedom, the major chance is that the tenant would give his preference to gas.

We have said that Parliament do not favour this new policy which has been invented through the possession of electricity trading powers. The tenant of any house within a certain distance of the gas-mains has the right under the general law, providing there is compliance with the prescribed conditions, to compel a gas undertaking to supply him or her. We have not heard of any power being vested in a municipal authority which abrogates that right of a tenant, and shackles him to a form of patronage which is detrimental to him. The Newport (Mon.) Corporation considered they had the power when in 1921 they compelled every tenant of the houses erected on the Somerton Estate to sign an agreement in which there was the condition that the tenant was not to use gas for lighting the premises. That is a case in which the gas supply is in the hands of a Company, and the electricity supply in those of the Corporation. In a Bill in Parliament this session (see *ante*, p. 444), the Corporation sought to obtain power, in connection with all lands and premises under their control, to place upon their use "such terms, conditions, and restrictions, as they may think fit." But a Committee of the House of Commons, in the interests of the freedom of the individual, added this provision: "The Corporation shall not make or impose under the powers of this section, any term, condition, or restriction with respect to the form of light, heat, and power, or energy to be used in any house, shop, office, warehouse, or other building, or on any lands, or with respect to the taking from any particular local authority, company, body, or person of any form of light, heat, power, or energy." The Rochdale Corporation and other local authorities who have any tender feelings for their electricity undertakings, and regard them as fit subjects for preferential treatment at the expense of individuals, should well consider this clause. Their policy which entails enforced patronage may lead to the whole question of the freedom of householders being raised in a very definite form, in view of the position of the general law regarding the right of tenants to demand a supply of gas, and the proper protection of the liberty of the individual against the prejudice engendered by municipal ownership of a trading concern.

Contrary Views.

In industrial polemics, the question at the moment of greatest interest to gas men is the one as to whether or not the competing electricity industry shall receive State aid and preferential treatment from the Government to assist its development. To the suggestion the gas industry is distinctly opposed on the grounds of its unfairness and unproved necessity; and it finds that a large number of long-sighted men in the electricity industry are of precisely similar opinion, and, in fact, hold views in the main according with those to which Mr. D. Milne Watson has given expression in two recent addresses. These, we are pleased to see, have arrested considerable attention, and have helped to promote thought on the subject, throughout the country. But naturally it was expected that there would be a fair amount of opinion in the electricity industry which would be diametrically opposed to that to which the President of both the Society of British Gas Industries and the National Gas Council gave utterance. The anticipation is fulfilled. We notice in one or two electrical papers that there are those in the electrical industry who (if their own industry were not concerned) would declare abhorrence of the principle of State aid to any one industry, but who are to-day searching carefully for excuses for accepting eleemosynary assistance from the State. These people, unlike others in their own industrial world, have no scruples in the matter; and they cannot bring themselves to the acceptance of the idea of rejecting (if offered) benefactions drawn from the pockets of taxpayers, even such large taxpayers as the rivals of electricity in business—the gas undertakings. But, apart from the iniquity of the proceeding—proposed, if not consummated—of the State giving assistance to a well-established and prosperous industry, these same electrical people appear to be so mentally dazzled by the suggested gift that they do not see that it must be accompanied by increased State interference, and, furthermore, that the Labour-Socialists are regarding the condition of State aid as the provision of a further stepping-stone to nationalization. These things are recognized by some wise electrical people, who are strongly hostile to such political schemes, and are ashamed that there should be in the electrical industry men who are willing to sacrifice its independence, and to try to extend its fortunes on political misconceptions and impracticable visions. They know them to be so, and are aware there is little benefit in them for the nation.

As an instance, there is the "Electrician," which, without controverting any of the definite statements and data of Mr. Milne Watson, indulges in a little veiled sarcasm; but it fails to advance anything material to show that his contentions and facts are baseless. As an example, it was pointed out in the addresses that cheap electrical power on the North-East Coast had not helped unemployment in the shipbuilding industry, and that in most industries the cost of power represents only a small proportion of the total works costs. This is how the "Electrician" attempts to counter the fair and sound submission of Mr. Milne Watson: "Electrical development will mean an increased demand for equipment of all kinds, and more raw material and more labour, which will relieve unemployment; and it will enable factories to be started without great capital expenditure, and so cheapen production, and again relieve unemployment." From what has been written in electrical quarters elsewhere, this particular prophet will not in this matter find universal honour in his own country. In the first place, what is meant by "electrical development?" What the politicians have in view is the development on a large scale of the sources of generation and the means of transmission; the idea being that this will cheapen electrical energy at the consumers' terminals. It is no use entering upon development of this sort without a demand can be created. Too much surplus plant and idle capital would be a heavy burden on the industry, and that would not cheapen electrical energy. Also, from the investigations which have been made, it is plain that the concentration of the generation of energy would only affect fuel costs, and any economy in those costs, the sagacious ones tell us, would be swallowed up in increased transmission expenses and losses. That is not the road to the development of electrical demand. The "Electrical Review," on the other hand, cautions its readers against undue optimism with regard to the cheapening of electricity supply as the result of changes in power station practice. Those in the electrical industry who are grasping for Government aid—financial and otherwise—should be sure of their ground before committing themselves. The writer in the "Electrician" further says that "the electrical industry is content to stand or fall on its merits." That is all we want; it is exactly that for which Mr. Milne Watson, in the name of the gas industry, is contending. It is only asked that the gas industry shall be kept free from State-aided competition—that the electricity industry should be "content to stand or fall on its merits." It is well that the gas industry should make this point clearly and forcibly before the Government positively determines to take the objectionable course; we hope the determination will be in the opposite direction.

We get much the same sort of criticism in "Electrical Industries." The editorial writer in this contemporary finds Mr. Milne Watson's comments "amusing." He does not cite the points that are so; and he deliberately descends to saying what is untrue when he asserts that the address to the Society of British Gas Industries "was one long protest against the popularity of electricity." It was nothing of the kind—not even inferentially. How it could be, we do not know, seeing that, a line or two further down in the comment, it is remarked that "Mr. Watson and other speakers *concentrated* upon the evil designs of the Government in 'bolstering-up' electricity." Our contemporaries who take the opposite view to the gas industry and to many competent electrical men appear to be unable to apply either logic or connected argument to the subject. The same paper says that it does not seem that the electrical industry needs "bolstering-up;" but "that it should be supported as a general benefit to the country, we cannot find it in us to condemn as iniquitous." There is plenty of evidence that the industry does not need "bolstering-up."

The several large generating stations that have been recently inaugurated, as well as the fat, unregulated dividends paid by many electricity concerns, prove this. It is difficult—indeed, impossible—to understand what possesses politicians who think that it does. However, we cannot see any difference between being "bolstered-up" and being "supported" by the Government. The opinions even of electrical experts are not in unison as to either the "bolstering-up" or the "support" of the Government being "a general benefit to the country." The iniquity lies in the proposal (if carried out) to give preferential State aid to a sheltered industry, without any proved need or national advantage. On the other hand, we have "Chemistry and Industry" writing in well-reasoned manner against State aid for any established industry.

It is not electrical power that will disperse the cloud of industrial depression. There are other factors more deeply rooted and widespread which require to be dealt with by the Government in the general interests of industry; and success in dealing with them would affect all industries alike, and so contribute to a common movement towards greater prosperity and relief of unemployment. Here, however, we have politicians contemplating, and endeavouring to persist in, a course which competent intellects believe is likely to do more harm than good. It was high time that a serious protest was made; and we are glad to find electrical men joining in it, and not being deterred from doing so by the flounderings and platitudes of some of their fellows.

A Cabinet Electricity Committee Appointed.

AFTER the foregoing article had been written, information came to hand to the effect that a Cabinet Committee has been appointed, under the chairmanship of the Attorney-General (Sir Douglas Hogg), to examine and report upon the electricity scheme drawn up by Lord Weir, Lord Forres, and Sir Hardman Lever. This course has been taken because it is believed that the matter could have more detailed consideration by a Committee than by the Cabinet as a whole. Thus final determination of this highly technical problem is to be of a political order. Perhaps this cannot be avoided. However that may be, there appears to be a disposition to push forward legislation. A preliminary draft of a Bill is being prepared by the Ministry of Transport for consideration by the Cabinet Committee; the hope being that the measure may be introduced before the summer recess, and carried through during the autumn. On the scheme generally, the Parliamentary correspondent of the "Daily Telegraph" makes this statement: "It is expressly disclaimed that the Government's proposals are on the lines of nationalization, because, while the State *will assist* in the great national developments that are projected, private enterprise will continue to be entirely responsible for the generation of electricity." If this is a true reflection of what is proposed, it indicates an intention of the Government to "assist" financially in the work of reorganization. One object is stated to be the gradual standardization of output, so as to facilitate the progress of linking-up the various generating stations. It is further presaged that the country is to be divided into areas, with provision for regional grouping of the electricity undertakings. By such means as these, together with the closing-down of the smaller stations, supplying the districts from super-stations, and carrying distributing systems into virgin areas, it is thought that it will be possible to ensure "cheaper power for industries, as well as cheaper current for domestic purposes." There opinions differ. If these indications prove correct, they will show that there are leakages somewhere, though the Weir report is supposed to be safely guarded until a scheme is finally adopted by the Government.

Coke and Sulphate in the Showrooms.

Is sufficient use made of our showrooms? That is a question that was asked in a paper read by Mr. H. D. Madden, of Cardiff, before the Wales and Monmouthshire Institution of Gas Engineers, as reported in this issue. We live and learn. The development of showrooms is the subject of evolution, the same as is that of most other things. In their case, the best development is made by the studied consideration of the purposes to which they are, or should be, devoted, and in most cases, the application of thought and inventive faculty will suggest means whereby they can be put to maximum profitable use. Mr. Madden's paper indicates various ways in which this can be done.

One part of the contribution we should like particularly to emphasize. There is a disposition in practice rigidly to follow the title of "gas showroom," and to utilize them only for demonstrating the merits of the various applications of gas. That is a limitation which amounts to short-sightedness. The gas showroom and its work, as well as the undertaking owning it and the consumers of gas, require the primary commodity to be at as low a price as circumstances will permit. We are passing through a period when secondary products are not yielding all we should like them to do for contributing to a low net cost per therm into the holder. To this end Mr. Madden's advice is to make use of the showrooms to give—particularly to coke and sulphate of ammonia—the largest possible publicity. But it must be publicity with the "goods" exhibited in a proper way, and suitably prepared for different services. As we travel about and make inquiry into this matter, it is found that in some areas anything that can be classified as coke is considered good enough for the market, and the indifference to cleaning and grading is something that is really calamitous to the building-up of a good trade in the commodity. We have no doubt it is the same in many parts of Wales as we have found it in several quarters in England. What Mr. Madden therefore recommends is that coke shall be given both the attention it deserves and the publicity it warrants; for, when properly prepared, it is an ideal smokeless fuel. He urges that the best coke possible should be manufactured by the use of selected and blended coals. In this connection, it is not always wise to give preference to the cheapest available coal; it is the ultimate cost of gas into the holder that matters, and in that coke plays an important part. Given good clean coke in graded sizes for all applications, prominent publicity in the showrooms, with appropriate literature at hand, and this fuel will begin to create a new demand for itself. Stress is also laid on the point that the showroom staffs must be in possession of correct knowledge regarding the suitability and uses of the different graded sizes, and be able to advise consumers and inquirers. Cardiff has found excellent benefit from these practices.

We congratulate the Company, too, upon what has been done in stimulating the sale of sulphate of ammonia in small quantities by giving prominence to it and its virtues in the showrooms. Only recently they commenced to offer neutral dry sulphate in 7-lb. linen bags, with instructions for use printed on the back. The product was shown and advertised in all the showrooms; and in a few weeks, more than 1500 individual sales were made. There have been heavy local purchases; and the radius from which inquiries now come has enlarged—due entirely to publicity, in which the showrooms take a part which cannot be over-rated.

More on these subjects will be learned from the paper. The Cardiff experiences authorize Mr. Madden to advise emphatically: "Never cease to hammer in the facts—Tell the world."

Gas Workers' Wages.

To-morrow is the day fixed for a further meeting of the National Joint Industrial Council for the Gas Industry to discuss the wages question. The position in which the matter was left on April 28 last was an agreement that no action on either side should be taken until the end of June.

Mr. Dunn's Thirtieth Annual.

Looking up a matter in the "JOURNAL" volume for 1896, it was noticed that the Annual Meeting of the Institution of Gas Engineers that year was the first at which Mr. Walter T. Dunn was present as Secretary. The one this week is therefore his thirtieth; and it promises to rank in interest with the best of those that have been held during the three decades. Hearty congratulations to Mr. Dunn, who, as the permanent official of the Institution, has done so much to help to mould its history.

Nearing the Date.

Papers for the Coke Competition must be delivered to the Editor of the "JOURNAL" on or before June 30. The conditions set forth in the "JOURNAL" for Feb. 18 must be observed.

Wembley.

The beautiful weather last week showed what a potent influence sunshine has upon the attendance at the British Empire Exhibition. The number of visitors on Bank Holiday alone was close upon a quarter of a million, and that was not by any means one of the most charming days of the week. The Gas Exhibit is securing, as it deserves, a large measure of attention; and, consequently, there is great satisfaction on the part of all who have had a share in its organization. Another feature has been introduced near the Exhibit. The enterprise of the Gas Light and Coke Company has brought into being a coke demonstration, regarding which particulars are given on a later page. At the sign of the "Jolly Jack Tar," the use of tar for road purposes is also being illustrated; and everybody is speaking of the attractiveness of this, as they are doing of the Gas Exhibit. The gas industry has made wonderful progress in the art of demonstration during the past few years; and for this there are men to whom we owe a large debt of gratitude.

Why that Big Span?

The question has been asked by many people why such a large span as 280 ft. is required for one of the sections of the temporary Waterloo Bridge. The secret has been divulged. It is that the Port of London Authority desired the London County Council to make it of those dimensions, in order to avoid the appearance of a "tunnel approach" at a portion of the river where it makes a bend, and where it is necessary there should be ample room for the navigation of steamers of 2000 tons, carrying coal to the Wandsworth Gas-Works. The growth of the gas industry has an influence even on bridge-building.

Mains of Insufficient Capacity.

In a note last week (p. 650), and in our "Parliamentary Intelligence," reference was made to the new mains-of-insufficient-capacity clause which has been agreed with the railway companies, and which will now be the one to be adopted in gas Bills and Orders. It has since struck us that, in the satisfaction of having this troublesome matter settled, no mention was made of the part taken in it by the little Pinner Gas Company, who valiantly, at their own cost, "stood-up" to the railway companies, and paved the way to the negotiations which have ended in the agreed clause [*ante*, p. 677]. The story of the part taken by the Pinner Company will be found in the issue of the "JOURNAL" for Aug. 6 last [p. 524]. In the negotiations which followed, the National Gas Council looked after the interests of the industry.

The Proposed Labour Alliance.

The great labour alliance which the extremest section of the Executive of the Miners' Federation desires to bring about is not going to be effected with a rush—if at all. There was a conference last Thursday between the representatives of the unions concerned. It was a big affair—105 delegates being present, representing 2,500,000 workers. The discussion is said to have been "animated," and to have continued for some two-and-a-half hours. The prime mover is Mr. A. J. Cook, whose aggressive and militant speeches about the country have not been to the liking of those trade union leaders who believe in operating in a constitutional manner. It is stated that there were clear signs at the conference that the miners' group had expected a more prompt response to their plans. But the feeling was that more information was required; while other unions were not going to be hustled into anything which might commit them to strikes to force demands of other unions, which might be hostile to the interests of their own members. For example, the miners' leaders at the present time are seeking a new wages agreement, and certain of them are anxious that the men should get more money with no obligation as to more production. This would mean increased cost of coal and a still lower demand from overseas; and such conditions would be injurious to employment in the very industries with the unions of which the miners are seeking alliance. From within the mining industry, evidence has come that the men can earn more money by increasing the production per shift. At the time of the last Trade Union Congress, the Miners' Federation had a membership of 750,000; the National Union of Railwaymen, 325,000; the Associated Society of Locomotive Engineers and Firemen, 59,000; the Transport and General Workers' Union, 295,000; and the Amalgamated Engineering Union, 245,000. These are among the Unions represented at the conference last Thursday. The desire for further information was general; and for this purpose it was decided to appoint a Committee. The resolution passed was as follows: "That in the opinion of this conference—having regard to the present industrial situation and the community of interests that must necessarily prevail among the organized workers—the furtherance of this movement could be best served by the appointment of a Committee to consider the suggestions submitted to the conference, and that each group of industries appoint two representatives to serve on that Committee, their names to be forwarded to Mr. Cook."

Nationalization of the Mines.

The Executive of the Miners' Federation have again been discussing the question of the nationalization of the mines, and have selected nine of their members to join a Committee of Inquiry, comprising three representatives from the Trade Union Congress, three from the Parliamentary Labour Party, and three from the National Labour Party. This Committee are to discuss the question of drafting a Nationalization Bill, which is to be regarded as the policy and programme of the Labour and Trade Union Movement. The Bill is to be the joint product of the miners and trade unions, and it will go a step farther than the miners' own Bill which not long ago was rejected by Parliament. The same fate will no doubt await the new Bill; but it will be of interest as mirroring the plans of Labour should ever they get a working majority in the House. A circular inquiry in the mining districts, it is stated, has resulted in a majority decision against any payment being made for minerals and royalties.

PERSONAL.

On Wednesday, June 3, at All Saint's Church, Rochester, was solemnized the marriage of Mr. LESLIE W. DUNN (elder son of the Secretary of the Institution of Gas Engineers) with Miss Sybil Beaney, elder daughter of Mr. R. J. Beaney, of Rochester. Hearty congratulations and good wishes to the happy couple.

In the pass list of the April examination for associate membership of the Institution of Civil Engineers appeared the name of Mr. W. J. COLLINS GARRARD, Second Assistant to Mr. Frank Prentice at the Ipswich Gas-Works. Mr. Garrard, who is the son of Mr. James S. Garrard, Secretary to the Eastbourne Gas Company, has now passed the whole of the examination.

RESIGNATION OF MR. T. BANBURY BALL.

An extraordinary position has arisen at Rochdale, following upon a recommendation of the Gas and Electricity Committee that electricity only shall be supplied to 66 Corporation houses that are to be built. As a protest against this policy, which he considers seriously injures the prospects of gas in other directions, Mr. T. Banbury Ball, who has for close upon 44 years been Manager of the Gas-Works, has resigned this office; and his resignation has been accepted with great regret—the Gas and Electricity Committee expressing their warm appreciation of the services he has rendered to the Corporation over this long period. Mr. Ball's views on the subject were clearly expressed in his letter of resignation, which was in the following terms:

> The Gas and Electricity Committee having decided to exclude gas from the 66 houses recently contracted for on the Cheltenham Street housing site, thereby seriously injuring the prospects of gas in other directions, I feel that I cannot continue to hold any longer the office which I have had the honour of filling nearly 44 years, and therefore beg to tender my resignation.
>
> No intimation was given me that the question was under consideration, so I have had no opportunity of expressing my views on the matter; but I am firmly of opinion that the tenants who are compelled by circumstances to occupy these houses should be free to exercise their own views as to what system of lighting, heating, or cooking they prefer.
>
> You will realize, I am sure, that I am taking this step with infinite regret; but I look upon the decision of the Committee in the matter as so serious that I have no other alternative.

It is understood that every effort was made by the Gas-Works Sub-Committee to induce Mr. Ball to reconsider his

decision; but he felt that he could not conscientiously do so in face of a policy which he regarded as inimical to the interests of the department for which he is responsible. The resignation then, as already stated, was regretfully accepted at a special meeting of the full Committee. At the conclusion of the meeting, the Chairman (Alderman Blomley) personally conveyed to Mr. Ball an expression of the high regard in which he is held by the Committee, and their great regret that they had no option but to accept his resignation most reluctantly. General regret at the necessity for so drastic a step on the part of Mr. Ball is felt in the town, where he is greatly esteemed for his courtesy and high integrity of character.

Mr. Ball has spent the whole of his working life in the gas industry; his first appointment having been at Jersey. In 1875 he transferred his services to the Leeds Corporation; and in August, 1881, he went to Rochdale. He is now 74 years of age. Practically the whole of the existing gas-works plant at Rochdale has been installed or re-modelled under his management.

The matter was debated by the Town Council last Thursday; and a report of the meeting is included in our news columns to-day.

OBITUARY.

ROBERT HALL BEST.

It is with regret that we record the death, which occurred on Monday, June 1, at his residence, No. 146, Hamstead Road,

The Late Mr. R. H. Best.

Handsworth, Birmingham, of Mr. Robert Hall Best, of Messrs. Best & Lloyd, Ltd., gas and electric light fittings manufacturers.

Mr. Best was born in 1843, and succeeded early to an important position in the firm with which he had been connected ever since—as part proprietor till 1878, then sole proprietor, and since 1879 as Chairman of Directors. It was his father, Mr. Robert Best, who founded the business. Although never a prominent public man (in spite of the many efforts to induce him to become a candidate for municipal and other honours), the deceased's social, educational, and philanthropic activities in Birmingham were many, and his influence in matters relating to art and industry in the brass trade went far beyond a local application.

Particularly was this the case with the results of his investigations into the economic conditions of the brass trade in Germany. Largely at his instigation, the self-constituted Commission consisting of Mr. W. J. Davis (then Secretary of the Brassworkers' Society), the late Mr. C. Berks, and himself, went over to Berlin on a tour of inquiry and research. The resultant report had a wide circulation, and stirred public opinion greatly. Long years of travel on the Continent, and his intimate touch with German manufacturers, convinced him that the Germans were not in the very retrograde state of civilization and development nearly everyone then thought; and Mr. Best was largely instrumental in inculcating a more general realization of the fast-growing efficiency in their manufactures, of their formidable business organization, and of their thoroughness in matters educational and scientific. He thus drew attention to the growing menace to our trade which Germany represented, and the need for rousing ourselves from lethargy in methods of education, as well as in the production and marketing of commodities, if we were to hold our own.

His next great work was propaganda for secondary education and trade schools. Here, again, he went to our trade rivals in Europe for example and precedent, spending a great deal of time in thorough investigation of these institutions in Germany—particularly in Munich. He brought his research to a head in a book he wrote in collaboration with Mr. C. K. Ogden, B.A., of Magdalene College, Cambridge, entitled "The Problem of the Continuation School." His main aim was to avoid the loss of training occasioned by so large a proportion of boys drifting into blind-alley occupations, and to replace it with wise education on broad lines; using trade classes as a focus of interest and a starting-point. It was not by any means purely vocational training he was after; the duties entailed by citizenship and the wide diffusion of simple economics and history, were, he thought, far more necessary for the training of an alert and efficient industrial people. He supplemented his writings on this subject by a great deal of lecturing; and his efforts only just missed bearing practical fruit in the brass trade. A school was about to be started in Birmingham, along the lines recommended by him, when the war broke out, and set-back the clock of progress in so many directions.

Another much needed reform for which he laboured was the application of art training to industrial needs. He was profoundly disappointed and discontented with the activities of art schools in the direction of improving design in industry, and worked hard for the linking-up of the art teaching in Birmingham with the manufacturing needs of the city.

His work as a town councillor for Handsworth was brief, and occasioned only by a disagreement of a section of the inhabitants of Handsworth with the proposal to include that suburb in the city's boundaries. He was strongly in favour of the greater Birmingham scheme, which came to fruition in 1911, and defeated his opponent at the Council election which was fought on that issue.

For many years Mr. Best had been President of the Brassfounders' Employers' Association, in which position his activities were highly appreciated by employers and employees alike. He was a man of wide sympathies, and of great knowledge.

His wife predeceased him in 1921, and his second son, Frank Behrens Best, was shot-down while flying over the enemy lines in 1917. He leaves one son—Mr. Robert Dudley Best.

We regret to hear of the death, at the advanced age of 91 years, of Mr. WILLIAM GARTON, formerly Accountant to the Nottingham Corporation. Although identified with the Nottingham gas undertaking for the long period of 63 years, he had, previous to that association, been in the service of Mr. William Hunt, Solicitor, of Nottingham, Clerk to the old Company. Upon the retirement of Mr. Garton five years ago, he was appointed Consulting Gas Accountant. Extremely conscientious in his duties, he was a man of great integrity, and a highly respected official of the Corporation.

The death occurred, suddenly, on the 3rd inst., of Mr. E. F. SPURRELL, Borough Engineer of Holborn. To Mr. Spurrell the newly-formed Institution of Public Lighting Engineers owed its inception; for it was he who, in the autumn of 1923, seeing the need of such an organization, called together those he thought might be interested. When the Institution was launched, he became a member of the Council, which position he held at the time of his death.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

June 12.—INSTITUTION OF GAS ENGINEERS.—Visit to Derby. Members should note that the luncheon will be in the Drill Hall, Derby—*not* the Assembly Rooms, as indicated in the programme.

June 19.—INDUSTRIAL GAS SALESMEN'S CIRCLE.—Meeting at the Council House, Birmingham. Inspection will be made of the industrial gas demonstration rooms and research laboratories of the Birmingham Gas Department, and visits will be paid to the Windsor Street heat treatment shops, and to the works of the Moss Gear Company, Ltd.

June 20.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Visit to the Cambridge Gas-Works.

June 30.—LAST DAY FOR COKE COMPETITION PAPERS.

ELECTRICITY SUPPLY MEMORANDA.

IN the last issue of the "JOURNAL," there appeared a letter from Mr. J. Horace Bowden, the Electrical Engineer of Poplar, which dealt with our recent comments on the charge for electricity for heating water for the public baths at Poplar, and on the waste of coal which results from the use of an agent produced at such a low efficiency as is represented by (so it now transpires) 2½ lbs. of coal per KW.H. Assuming the coal has a heating value of 13,000 B.Th.U. per lb., the production of 3420 B.Th.U. per 32,500 B.Th.U. in the coal would be equal to 10·5 p.ct. efficiency. We should like to preface further remarks by saying that "impudent stunt" and "real live" Electrical Engineer of Poplar were quoted in our comments and were expressions published in electrical papers. Our readers will remember that an electrical paper made the claim that the heating by electricity of the water for the Poplar baths was cheaper than by gas, and that was why gas had been "thrown out." The comparison was made with gas at ordinary price and electricity at a charge representing average fuel costs or thereabouts—no other cost being included. No one can legitimately claim that this is an ordinary commercial transaction; but Mr. Bowden is not different from other electrical engineers in adopting extraordinary arguments for justifying what he is doing. We have not the slightest doubt that this public bath water-heating business is purely preferential because it is a municipal undertaking. The current being taken at off-peak periods, our correspondent calls the supply "a bye-product," and says it must be regarded as such. The suggestion is a remarkably subtle one; but we have a notion that the Poplar Borough Council Electricity Committee would be rather reluctant to supply electrical heat on the same terms during off-peak hours for other purposes. But why not, if it is such a good thing for the undertaking? We see that the electrical energy for the public bath water heating is supplied between the hours of 5 and 8 a.m. (which covers breakfast time), and between noon and 2 p.m. every day and after 1 p.m. on Saturdays. Those times would cover the dinner period for most people in Poplar. Then why not sell the "bye-product" for domestic cooking at average fuel costs? The bye-product argument can be beaten-out to diaphanous substance. Why, too, select fuel costs only for averaging-out in order to decide the charge for supplying heat to the water for the public baths? The trick of averaging the fuel costs over a large consumption basis, and the other costs over a small consumption basis, and making the latter pay all the "other costs" is not equity.

Poplar Bath Water.

Mr. Bowden claims that this sort of supply is a bye-product, and must be regarded as such; and he says that in the gas industry bye-products are worth exactly what they will fetch in the market. That is a perfectly philosophic and yet obvious statement. Applying it to the off-peak-load electrical "bye-product," it is clear that this will not fetch much per unit in the market, and the same applies to electric cooking and heating and much of the power business—not all off-peak loads. Mr. Bowden is ingenious; but he has overlooked the fact that there is no analogy between his bye-product and the bye-products of gas manufacture. Every one of our bye-products stands in a different class. They are not the same as Mr. Bowden's "bye-product," which is in every respect identical with his primary product; and the only excuse he can find for calling it a bye-product is in the incidence of its use in respect of time. In the case of our secondary products, every charge in their preparation for the market is accounted for in the price; and Mr. Bowden cannot show us any case in which the whole of these charges are not fully covered by the revenue, even in this time of poor markets. It is only because the profits are less from the secondary products that the aggregate sum to be deducted from the gross cost of coal leaves the net price of the latter at a figure which has compelled in some cases the raising of the price of gas. But we cannot detect any real profit in Mr. Bowden's electricity "bye-product;" and, anyway, the price charged shows that it is a "bye-product" of exremely low intrinsic value from the heating point of view. He would not charge that price if it could command a higher one. Gas undertakings are not so foolish as to sell gas at the "average net cost of coal." If they were, the Gas Company supplying in Poplar would have been able in 1924 to sell at about 2d. per therm—the net cost of coal having been 1·848d. per therm. To obtain the same potential thermal value from electricity rather more than 29 KW.H. would be required. Differential prices do obtain in the gas industry for different services; but not such differential ones as are the vogue in the electricity supply industry. It would, of course, be possible to sell gas at convenient times at a little over net cost into the holder; but then there would be distribution and other charges which would have to be borne by the consumers generally. Those charges exist in all manufacturing establishments, including electricity undertakings; and in many manufacturing works, including gas undertakings, there are times of the year when a large part of the plant is standing idle. Even in winter time there has to be a good margin of gas plant to meet the vacillations of the heating load, which are often of a somewhat violent order. There are not, therefore, such extraordinary differences in electricity supply and gas supply as Mr. Bowden pictures in, we think, shallow fashion for the purpose of justifying a charge for water heating at a little above the average cost of fuel—leaving the burden of other costs to be borne in other quarters. We are not shivering over his prospective raising of steam from the waste fuel of collieries. When he uses it in his boiler furnaces, he may find that it would be rather a good thing to employ a proportion of gas coke on (say) the Sandwich system, in order to get a porous, free-burning fuel bed.

The "Bye-Product."

Mr. Bowden's letter does not deal with the question of extravagant heat expenditure for raising the temperature of water by electrical energy, beyond the incidental remark as to the use under his steam-boilers of waste fuel from collieries. We had therefore hoped that, if Mr. L. Jefferson-Hope, the Chief Superintendent of the Poplar Borough Baths and Wash Houses Department, replied to our criticisms, he would have discussed this particular point, which is one of extreme importance in connection with the utilization of fuels for any purpose. He contributes a letter to this week's issue of the "JOURNAL;" but he entirely avoids making any point of our criticism regarding the larger tonnage of coal required to do a certain amount of work the electrical way than is needed by using the fuel directly under a steam-boiler. It is perfectly obvious this would be so when one considers the efficiency of a boiler; and then, using the steam for electricity generation, note how the efficiency tumbles down to an extremely low point—in the case of Poplar to about 10½ p.ct. of the original thermal value of the coal. Instead of dealing with this technical matter (which is to-day regarded as being of vast importance in connection with the conservation of coal and the co-ordination of the use of our fuel supplies), he tells the story of how the Gas Company supplying in the district missed this particular load. This is, of course, interesting up to a point; but it does not bear upon the general question of whether or not electricity, from either the thermal or cost points of view—if a fair commercial charge is made—is a rational method of providing heat for raising the temperature of water. In passing, it is observed that our correspondent states that coal-fired boiler plants are uneconomical for his particular purpose on account of the intermittent character of the business. However, we thank Mr. Jefferson-Hope for his work in favour of gas heating, though this did prove abortive; but really there is nothing in his communication which calls for a reply from us, as the policy of the Gas Company in respect of this particular load is not a matter which would lead to any profit by being discussed in our columns.

An Important Point Avoided.

On various occasions we have advocated that more information should be supplied to the daily and weekly newspapers as to the technical position and progress of the gas industry in the utilization of coal, as well as in the application of its products to domestic and industrial services. We suggest that there is a writer on the staff of the "Yorkshire Post" who requires a little light and leading on this subject, for he has given the best possible certificate to the need that anyone could possibly pen. An editorial article appeared in the "Post" on the subject of "The Government and Electricity." Mr. Arthur Bray wrote to the Editor protesting against the ignoring in the paper of the great advantages that gas has over electricity in lighting, heating, and cooking. He also criticized the suggestion that electricity should be subsidized at the expense of gas, and pointed out that the arguments in favour of subsidization could be applied equally to gas undertakings as to electricity supply ones. But he cannot see why either should be assisted; his preference rightly being that both should work in healthy competition. Among other points made by Mr. Bray was that, if all the houses in Leeds were equipped with gas appliances for heating, cooking, and hot water supply, four-fifths of the pollution to which the editorial writer referred would disappear, and the pockets of householders would on balance greatly benefit. In an editorial note appended to the letter, there is displayed a want of knowledge which is to be deplored in a paper of such influential standing as the "Yorkshire Post." Allusion is made to Mr. Bray's statement as to four-fifths of the pollution of the air being removed by the use of gas; the editorial note writer saying five-fifths would be removed by the universal use of electricity. Of course, Mr. Bray did not intend his "four-fifths" to be regarded as a definite proportion. He knows what apparently his critic does not, that in industrial work it is impossible to eliminate entirely the use of solid fuel; so that there could be no universal application of either gas or electricity for industrial heating. Electricity cannot do more than gas in purifying the atmosphere, and as a matter of fact it would be ruinous to individuals and disastrous to the country at large to attempt it.

Educate the Daily Newspapers.

An Unsupported Statement.

This brings us to the most important statement of the writer of the editorial note. He says: "Our leading article suggested that electricity which serves both the domestic and industrial purpose could, under a well-co-ordinated national scheme, be produced and distributed at a unit cost sufficiently low to help industry and ease the burden of the householder, whereas it is now impossible to co-ordinate coal and gas supplies." Our contemporary will excuse us pointing out that the statement is wholly senseless. We should like to know the grounds, supported by data, on which he bases the suggestion. There are physical obstacles in the way of electricity being produced at a unit cost sufficiently low to make its use universal for heating; and the waste of our coal resources would soon show itself in a manner so appalling that the writer in the "Post" would wonder why he had been led to entertain such fantasy as he declares possesses him at the present time. He considers, too, that gas is a form of power which is rapidly becoming obsolete. We should be most happy further to discuss this matter with the writer in our contemporary, if he will supply us with the grounds upon which he bases his dogmatic assertions. But we would suggest to him that in a technical discussion it is rather childish to write thus: "It must, in conclusion, be admitted that electricity will never be as efficient as gas at leaking from faulty lead piping to the benefit of the gas undertaking's receipts and the detriment of the unsuspecting ratepayer and his family."

WEMBLEY AND THE ARTS OF DISPLAY.

Sir Lawrence Weaver's Book.*

The British Empire Exhibition affords a unique opportunity for the study of a type of publicity which has for too long in this country been practised without being understood. Sir Lawrence Weaver, Director of United Kingdom Exhibits at Wembley, has published this spring a book which should prove of permanent value in preserving many of the lessons that Wembley is able to teach us. He sets out to consider solely the question of display, but without digressing from his argument he provides incidentally much information and criticism on many aspects of exhibition work; and his 366 beautifully reproduced illustrations serve admirably to drive home the points. To the gas industry, moreover, because the industry both was and is so well represented at Wembley, the book has a special interest.

Why is it fair to say that the arts of exhibiting are not understood? Because the object of an exhibition is so rarely grasped. Not only the man in the street, but the exhibitor himself is constantly heard to ask: "Does such-and-such an exhibition pay?"—meaning, of course, "Can you trace any definite results directly to it?" The question is proof at once of the failure to understand its object. For the object of exhibitions, as Sir Lawrence Weaver says, is "publicity, not sales;" in other words, they are, like other kinds of advertising, a casting of bread upon the waters. The exhibitor should aim not at meeting the immediate needs of those who visit his exhibits, but at leaving upon their minds an impression which will be remembered when at some future date a need is felt. The crowds, for example, who daily pass through the Wembley Gas Exhibit have not gone there to see if gas can solve this or that problem for them; they are for the most part casual wanderers "seeing what there is to see," pausing wherever something picturesque, or something wonderful in size, in colour, or in movement, may happen to arrest them.

This is the reason why, at an exhibition designed for the million, it is wrong to display all your wares or products in uninspiring rows, and why it is right to give some picture such as the Gas Exhibit Committee have evolved, which pleases and educates, but does not pretend to say: "Here in a nutshell is all that the gas industry can do."

Admit but this, and it follows at once that the success of an exhibit depends very largely on the "arts of display," in which, as Sir Lawrence Weaver says, "no artist is too good to be employed;" and the same will apply to the architect. Sir Lawrence Weaver illustrates this well from last year's Wembley Exhibition—and, much more easily, from the Munich and Gothenburg Exhibitions of 1922 and 1923; for in Germany the value of originality and art were recognized far better. The value of art can be illustrated again from an exhibit new to Wembley this summer—that delightful and arresting scene of the road beside "The Jolly Tar," which winds away upon the backcloth into the hills painted by Norman Wilkinson, and is perhaps the most effective exhibit of its size in the whole Palace of Industry.† And the Gas Exhibit itself, last year's display—and how much better this year's!—is cited by Sir Lawrence Weaver as one of the best examples in the whole Exhibition.

To us his comments have a special interest. With obvious sincerity he points out that "the success of an industry's display will normally depend upon the more or less complete community of interest between the participating exhibitors. The ideal is achieved when the participants are prepared wholly to sink their individuality, and to concern themselves only with the ideal presentment of the scope and possibilities of their industry"—when, that is to say, they recognize that their object is "publicity not sales." The ideal is, however, in the author's view, not readily achieved "save in the case of a widespread public service such as the gas industry;" the fact, of course, being that the gas industry has to an unparalleled extent established, not merely for exhibition purposes, but for all its activities, a system of genuine co-operation which has the right spirit behind it. The result, to quote Sir Lawrence Weaver, is that "the whole Exhibit was organized in the interest of all gas undertakings, whether owned by companies or municipalities, including many outside the United Kingdom"—and, he might have added, equally in the interest of all the appliance manufacturers. "Its anonymity," he continues, "added to the conviction of efficiency and service which was impressed upon the minds of visitors, due in no small measure to the skill with which Mr. Austen Hall, the Architect to the Committee, had planned and decorated a charming co-ordinated display."

Such is Sir Lawrence Weaver's praise for the Exhibit of last year. He would be bound to speak even more highly of "the second edition." For in his concluding chapter on "Exhibitions of the Future," he has made an appeal not only for that "harmony of display," that co-ordination which was already a striking feature of the Gas Exhibit, but also for better lighting, better velaria, more invention in colour schemes, and, above all, more movement. In every one of these respects the Gas Exhibit, 1925, has gone one better than its predecessor—and the Exhibit of last year was good enough to be deemed worthy of nineteen pictures in the book, one of them a whole page in colour, showing the spacious and artistic Rest Lounge.

We said that Sir Lawrence Weaver was not guilty of digression. We admit an exception, but forgive it. He has a chapter on the Exhibition posters; and in that chapter one concluding paragraph which deals with the posters used by individual exhibitors. It is worth quoting in full:

> "And when the posters issued by the Exhibition authorities themselves are detailed, the story is by no means told. Many fine posters were used by exhibitors themselves to advertise their wares or to call attention to their display in the Exhibition. For the most part, and naturally, letterpress posters best served their purpose, but in one case they indulged, with particularly happy effect, in the work of a very able poster artist. I refer, of course, to the very striking poster by Mr. Septimus Scott, issued by the British Commercial Gas Association, and entitled 'The Spirit of Coal.' Starting as a sixteen sheet, it proved to be easily the most ubiquitous of the Exhibition posters. It rose flaming from the hoardings. It looked down from the sides of houses. As a double-crown it found its way into the railway stations, and in still smaller form it adorned the advertisement pages of newspapers and magazines."

High praise. But was it not deserved?

* "Exhibitions and the Arts of Display," by Sir Lawrence Weaver, K.B.E. Published by the Proprietors of "Country Life," No. 20, Tavistock Street, Covent Garden, London, W.C. 2. Price 30s. net.

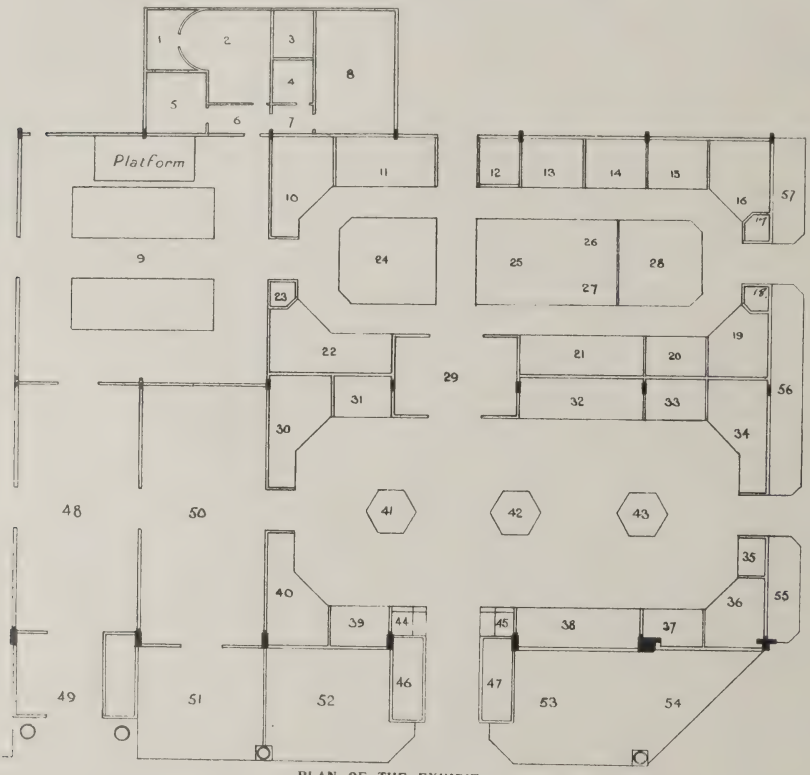
† The National Gas Council's "British Tar for British Roads" Exhibit in the Chemical Hall (described and illustrated in the "JOURNAL" for May 13).

Card Printing Cheapened by Gas.

Many people, says "Industrial Gas," met for the first time last Christmas the engraved process cards and announcements; and they wondered how it was possible to produce such cards so cheaply. This engraved process printing consists of printing with an ordinary press; and this is followed by a heating operation. A slow-drying ink is used in the printing, and then the cards are dusted with a resin or shellac base powder. An automatic shaking operation removes all the powder except that which sticks to the wet ink. The cards are then heated in an oven, and the powder becomes merged into the ink. In this process a uniform heat zone of correct temperature is essential. Any variation in the heat zone temperature while the work is in progress will result in spoliage. Electricity was first used as a heating medium; but owing to the large percentage of blow-outs, the uneven work produced, and the high cost of operation, it was decided to employ gas. Using this fuel not only produced cards that were better than those resulting from electrical heat, but a great saving in operating costs was realized. With the gas-fired machine, it was possible to secure a far greater variation of heating than was possible before. Further, with electricity it was necessary to have twelve machines in working order all the time; whereas with gas only seven were required. A two months' comparison made in connection with a New York plant before and after the conversion to gas shows a really large saving made in fuel costs alone, to say nothing of greatly increased production, &c.

BRITISH EMPIRE GAS EXHIBIT.

READERS who are visiting London this week to attend the annual meeting of the Institution of Gas Engineers, are, of course, arranging to include in their programme at least one inspection of the British Empire Gas Exhibit, in the Palace of Industry at Wembley. With the main features of the remarkable display to be seen there, they will already have made themselves familiar, by the aid of the detailed description that was given in the "JOURNAL" for May 13, and the various photographs which have since appeared in our pages; and the addition of the accompanying plan of the exhibit, with the explanation of the figuring, will make it perfectly "plain sailing" for them.



PLAN OF THE EXHIBIT.

1, 2. Allocated to Society of Women Journalists.
3. Store.
4. Office.
5. Demonstrator's kitchen, with geyser and gas cooker.
6, 7. Lobbies.
8. Committee room.
9. Cookery demonstration hall, with selection of cookers and hot water appliances placed on stands around the walls. On the demonstration platform are two eye-level cookers.
10. Model domestic kitchen, fitted with cooker, combined coke and gas boiler, and other labour-saving devices—including a low-pressure gas iron.
11. Laundry, with a big high-pressure iron for the ironing of large articles, and other high-pressure and low-pressure irons; also drying cabinet, and two coppers for the boiling of the articles washed.
12. Illustration of shop-window lighting, showing sulphate of ammonia and various bye-products.
13. Greenhouse, fitted with outside gas water heater for providing the heat necessary for the cultivation of flowers.
14, 15. Views of a room under varied conditions. In the first case the room is heated by gas, with the result that one observes a general appearance of cleanliness—the window revealing a clear and sunny atmosphere. The second view is of the same room heated by a coal fire grate, with the result that the appearance of the room is dirty, owing to the smoke of the coal fire and the dust from the cleaning of the grate and removal of the ashes. From the window is seen a smoke-laden atmosphere.
16. A 20 B.H.P. gas engine used for driving a dynamo for generating electricity for the working of the ventilation fans, and running of motors for compressors, &c. The special feature of this stand is the raising of steam by utilizing the exhaust gases from the engine.
17, 18. Fan chambers.
19. Main meter house.
20. Chauffeur's kitchen, lighted by gas, with gas cooking stove, gas copper, and coke fire.
21. Garage, lighted by safety gas lamps and gas radiator. There is a work bench, with brazing hearth and gas-heated soldering iron.
22. Hotel kitchen, illustrating the application of gas to large cooking requirements.
23. Fan chamber.
24. Cinema lounge.
25. Converted coal fire stand, showing old-pattern coal fire grates adapted to the fitting of modern gas fires.
26. "Hobbies"—work bench provided with gas-heated soldering-iron stove and glue pot.
27. Jewellery stand, with small enamelling furnace.
28. Pottery stand, having a gas-fired pottery furnace.
29. Ante-room, with handsome gas fire.
30. Children's nursery, lighted and heated by gas.
31. Bathroom, demonstrating lighting and water heating by gas.
32. Log cabin, showing various articles in the manufacture of which gas or its products play an important part.
33. Fruit bottling—boiling of fruit by the aid of a gas cooker.
34. South Africa—interior of room heated and lighted by gas.
35. Larder, demonstrating the making of ice by gas.
36. India—bathroom lighted and hot water supplied by gas.
37. Verandah, showing coloured fabrics illustrating dyes obtained from tar.
38. New Zealand—interior of room lighted and heated by gas.
39. Kitchenette, showing modern kitchen lighting, heating, and hot water furnished by gas. Every convenience in a small space.
40. Canada—interior of lounge hall, lighted and heated by gas.
41, 42, 43. Pylons of fires of various finishes and designs.
44, 45. Inquiry counters.
46, 47. Stores.
48, 49. Empire food exhibit.
50, 51. Coke exhibit by the Gas Light and Coke Company.
52. Motor trades exhibit, showing various gas appliances used.
53, 54. Gas engines exhibit, showing 150 B.H.P. and 17-19 B.H.P. engines, and gas-heated wafer making machine.
55, 56, 57. Industrial gas exhibit, displaying various types of furnaces for case hardening, metal melting, sugar boiling, pottery work, &c.

Distinguished Visitors.

The Gas Exhibit has recently been honoured by the presence of some distinguished visitors. On Friday, May 28, their Royal Highnesses the Duke and Duchess of York spent a considerable time in this attractive portion of the Palace of Industry, and were greatly interested in the entire display made by the Gas Exhibit, which they regarded as an excellent one. They were particularly struck by the ice-making machine, which was in operation, demonstrating the making of ice by the application of gas. They also commented on the artistic display of lighting fittings, and the control switch, whereby gas is rendered as convenient as electricity.

This is what the "Daily Graphic" had to say on the subject: After lunching at the Garden Club, the Duke and Duchess of York spent the greater part of the afternoon going over the extensive Gas Exhibit in the Palace of Industry, where the Duchess was especially interested in the many domestic labour-saving appliances. In the Model Laundry a frock was being ironed by the giant "Gladiron," which weighs 90 lbs. The assistant had to explain to the Duchess every detail of its working by gas pressure operated by electric motor, the electricity for which is generated by gas. Another exhibit in which she was especially interested was the gas refrigerator. "Fancy making ice-cream by gas!" she exclaimed. "It does seem strange."

The Archbishop of Cape Town and Princess Beatrice visited the Exhibit on the following day, when the Archbishop said that the South African room was a very realistic representation. H.R.H. Princess Beatrice manifested a very lively interest in the display, and asked a number of questions which indicated her appreciation of domestic problems.

Other visitors have included Sheik Hamad bin Isa al Khalifah and his brother Sheik Abdulla, who, in their robes of black and gold and brown and red, with picturesque embroidery, proved keen inquirers after truth. Sheik Hamad placed an order for one of the ice-making machines just alluded to—explaining that he has recently started an ice-making factory in his dominions. A description of this novel little machine—the "Delaygue" refrigeration plant—was given in the "Journal" three weeks ago [see p. 523]; and the appliance will probably find a place in many showrooms, for ice making by gas as a feature could be safely trusted to arouse keen curiosity and to lead to business.

These distinguished visitors from near and far are an illustration of the very real interest that is being displayed in an exhibit which has had praise bestowed upon it from all quarters.

Gas in Jewellery Work.

The attention of those inspecting the Gas Exhibit may be drawn to a large glass case filled with handsome personal ornaments, into the fashioning of all of which gas has entered.

Our Photographs this Week.

We are able in this issue to add to our series of photographs.

BEDROOM-BOUDOIR IN THE NEW ZEALAND SECTION.

An Up-Country Store.

Gas Equipment for a Hotel Kitchen.

One would find it difficult to make a choice for tasteful arrangement from among the various Empire scenes; but in any such choice New Zealand would no doubt be in the front rank. It takes the form of a bedroom-boudoir, heated by a gas fire harmonizing with the period and decorations of the room, and lighted by gas brackets and table lamps. The next is a realistic reproduction of an up-country store, such as the pioneer depends upon in every Colony or Dominion. The contents of this store serve to illustrate the manifold resources and uses of gas in industry, as the whole of the stock consists of either bye-products of the gas industry—*i.e.*, disinfectants, drugs, fur preservatives, sheep-dip, &c.—or articles in the manufacture of which gas or one of the many bye-products of gas making is habitually used. The range of articles shown is enormous. Lastly there is portrayed modern gas equipment for a hotel kitchen—every item of which speaks for itself, and for efficiency, cleanliness, and the saving of labour.

Housing Section of the Gas Exhibit.

In the Palace of Housing, space is occupied by what is named the Housing Section of the British Empire Gas Exhibit. Here is to be seen an appropriate display of cookers, fires, hot water apparatus of all types, gas irons, boiling rings, grills, hotplates, &c.—in fact, everything in the shape of gas equipment that is suitable for use in the home. The nearness of this display to the model houses will no doubt make it of substantial value as a "business getter," though nothing of an elaborate nature has been attempted here. The attention of the public is drawn to the fact that it is a supplementary stand, and they are invited to visit the main Gas Exhibit in the Palace of Industry. Two large boards tell the stories of (1) gas in the domestic field and (2) gas in the industrial field.

THE WEMBLEY COKE EXHIBIT.

Gas Light and Coke Company's Successful Demonstration.

Propaganda work of first-rate importance is represented by the excellent Coke Exhibit which has been undertaken by the Gas Light and Coke Company in a compact space adjoining (and communicating with) the British Empire Gas Exhibit. At first blush it might appear difficult to make anything with a "draw" in it out of a coke exhibit. Not at all. There is to

be seen here—on the very threshold of the exhibit—a device which will ensure for the display a steady stream of popularity. It was, indeed, a happy inspiration to fit up in this commanding position—outside the exhibit proper, and in the main gangway leading to the conference halls—a hot water fountain, giving a plentiful supply at 180° Fahr.; the end being thus successfully achieved of definitely associating coke with hot water. The hot water for this fountain is supplied by coke boilers in operation within the exhibit; and it makes an irresistible appeal to curiosity.

This curiosity once aroused, interest must inevitably grow; and the inquirer will enter what most nearly represents, perhaps, the big reception hall of a mansion. The exhibit has been designed by, and constructed under the instructions of, Mr. Walter Tapper, F.R.I.B.A., of No. 10, Melina Place, London, N.W.; and he has produced a delightful result within the small space at his disposal. In fact, one can fairly bestow upon it the highest praise, and say that it is fully worthy of the Gas Light and Coke Company, from whatever aspect it is viewed. It demonstrates effectively one basic fact to all and sundry—that there is no need to wait for a smokeless fuel; for such a fuel is already here, available for every purpose for which fuel is required.

Fires and Boilers.

Three open coke fires will be found of special interest. The first shows an ordinary well grate, adapted on the principle advocated by Prof. C. V. Boys, F.R.S.—that is to say, all access to the underside of the fire is cut off. The fire burns on a blank firebrick hearth, demonstrating the fact that, instead of a strong draught being necessary, a coke fire burns brilliantly with a minimum amount of draught. Next there is an Eagle Range Company's hearth grate, which also has a firebrick bottom, but provision is made for the removal of fine ash into an ash-pan below. The third open fire is a "Florence" grate

made by the London Warming Company, which is provided with a back boiler, giving a plentiful supply of hot water.

Other exhibits include a model artizan's kitchen equipped with a "Sentry Minor" coke boiler and a gas cooker; while a radiator is connected-up, to demonstrate that an adjoining room can be heated from the same coke boiler. Another model kitchen is provided with a "Koke" boiler. This is a steel boiler, made by Messrs. Balmforth, of Luton. It has a long life, and is not liable to crack, though such failures among the cast-iron boilers so far are unknown. A model bathroom contains a wash-basin, towel rail, and magnificent bath.

Finally there is a selection of coke fired boilers which have been tested and proved by the London Coke Committee.

The Industrial Side.

In the industrial exhibit outlets for coke as a fuel are demonstrated mainly on the "Sandwich" system. There is a large-scale model of a modern water tube boiler, as used by the London County Council, and at other power stations, fitted with mechanical stokers adapted for coke and coal firing on this patent "Sandwich" system.

It may be recalled that the London County Council have recently purchased 45,000 tons of coke for use on this system. Deliveries of coke are to be made at the rate per week of about 1400 tons, equivalent to some 50 p.ct. of the total fuel consumption of the power station. The need for economy in operating the London County Council tramways is only too well known; and it is gratifying to note that, as a means to this economy, coke has been adopted for use in preference to crude coal.

Incidentally, this use of coke at important power stations—which include those of Marylebone and the London Electric Supply Corporation—illustrates a form of co-operation between the electricity supply and gas supply industries which is not only practicable but economical, as well as being in the national interest.

ROAD TAR AT WEMBLEY.

At the Sign of "The Jolly Tar."

Mention is made of the visit recently to the British Empire Gas Exhibit of Her Royal Highness Princess Beatrice and party; and also Sheik Hamad, with his brother Sheik Abdulla. On the same occasion both parties inspected the British Road Tar Exhibit of the National Gas Council in the Chemical Section of the Palace of Industry, and expressed keen pleasure at seeing so attractive a display. Her Royal Highness's exact words were "a very charming and useful exhibit."

Quite a lot of inquiries are being received at the stand; and they are not only from home sources. The President of one of the largest Paving Companies of America admitted the pleasure the exhibit had given him, and his appreciation of the information he had derived from it. An interesting feature is the number of what may be termed domestic inquiries—*i.e.*, in connection with garages, garden paths, &c.

TARRED ROADS AND FISH LIFE.

In another part of the Chemical Section of the Palace of Industry is a very ingenious working model which is attracting a deal of attention, and is understood to be exhibited by the South Metropolitan Gas Company. Water to imitate rain is continually running straight off three separate sections of tarred road into a pond in which numerous fish are swimming about.

The model is in the interests of "specially refined road tar, non-toxic for fish and plant life." It is pointed out that the "two periods when surface drainings from a road treated with ordinary tar are considered toxic to fish life are: (*a*) Immediately following the application of tar; and (*b*) when disintegration of the road surface occurs." In order to reproduce these conditions, one section of the roadway in the exhibit is retreated periodically; the remaining sections being allowed to age normally.

GAS SUPPLIES AT WEMBLEY.

The use of gas at the Wembley Exhibition is still extending. We learn from the Brentford Gas Company that a large number of additional supplies have been put in.

The Chiswick Boot Polish Company are using gas for the necessary operations of melting and filling the tins with their "Cherry Blossom" boot polish. Steam is produced by means of a Briggs gas boiler; and this steam is carried round the vessels containing the polish, keeping it in a melted condition, and enabling the tins to be readily filled. The whole of the process of the Chiswick Boot Polish Company is of extreme interest to visitors to the Exhibition.

National Milk Publicity are also using gas in connection with their exhibit. It is employed for various purposes of pasteurization, &c., and their call has been for a 50-light meter. Virol, Ltd., are taking gas for the heating of the necessary urns for the provision of hot water and giving publicity to their product. The Express Dairy Company have also called for larger supplies. Messrs. Birds have now two "Regulus" cookers for exhibiting various special products of their manufacture. A supply of gas has been carried into the building used by Planters' Products, Ltd. This was formerly occupied by Messrs. Braby, and is entirely of metal construction. Bovril, Ltd., are using gas for boiling water.

The Canadian National Railway have asked for a supply of gas, as have Glaxo, Ltd., Pure Food Products, East Africa, Port of London Authority, Messrs. Lawrence & Parker, and Kenya Colony. Major Dugdale is using gas in connection with the rearing of chickens. Tea rooms have been fitted-up in Malaya, requiring the provision of a 50-light meter. Australia has considerably extended the use of gas, and an additional service has had to be laid.

The Brentford Gas Company inform us that their sales are satisfactory, and on some days have already been higher than they ever were during the British Empire Exhibition of 1924.

The South Australian Government have engaged Dr. Hyman Herman to investigate and report upon the possibilities of utilizing the brown coal deposits at Moorlands, South Australia. The lease of the land, formerly held by the Tailem Bend and Murray Coal Company, has now reverted to the Crown. An area of 73 miles has been reserved, and the Government have put down eighty-five boreholes. The average thickness of brown coal is 14·8 ft., and the average depth from the surface 79 ft. The total area so far proved by boring is 389 acres, and the brown coal available is estimated at over 8 million tons.

A PLEA FOR CO-OPERATION BETWEEN THE GAS INDUSTRY AND THE TRADER.

By F. CORNELIUS-WHEELER.

TIME was when the gas companies were almost the sole distributors of gas apparatus throughout the country, and rightly so, because the various undertakings made a scientific study of gaseous fuel, selected the right type of apparatus to use in varying circumstances, and devoted careful attention to safe and proper methods of installation.

During the last decade, conditions have somewhat changed, consequent on the enlightenment of the public regarding the advantages of gas for heating and cooking, due to the active and far-reaching propaganda advanced by the industry and the British Commercial Gas Association. The trade is perhaps in a greater degree realizing the possibilities of gas as a means by which household drudgery can be reduced to a minimum, thus adding to the comfort of the people by the elimination of unnecessary labour, dirt, and dust, and removing the cloud of smoke which enshrouds our bigger cities. Anything that can mitigate the smoke nuisance caused by burning coal in the open hearth, which is aggravated tenfold during foggy weather, deserves to receive the widest consideration.

If these facts are accepted, as on reflection they must be, surely the time is now ripe for closer co-operation between the gas industry and the traders, builders' merchants, and ironmongers, who handle all kinds of apparatus designed for domestic heating and cooking. The industry, in the past, has been inclined to regard the development and utilization of gas apparatus as a close preserve, due in a large measure to the inferior articles marketed by the trader, and to the inefficient, and sometimes dangerous, methods of fixing. This state of affairs has been still further induced by the fact that countinghouse economies made the re-sale of reliable gas apparatus by the trader an unprofitable business. The trader, in consequence, unless he be a commercial philanthropist, could hardly be expected to push the sales of gas fires and cookers at the expense of coal grates and cooking ranges, from which he could anticipate deriving a reasonable rate of profit, and allow for overhead and establishment charges.

Until trading conditions are improved, merchants as a whole will be apathetic towards the re-sale of gas fires and cookers, and will devote their energies to pushing the sales of goods dependent on the use of coal.

A brief reference has been made to the faulty methods of fixing gas apparatus by those outside the industry, who sometimes appear woefully ignorant of the elementary principles governing the satisfactory use of gas. It may be argued that legislation should be framed to guard against the evils that may arise through ignorance or avarice; but until such time arrives, it is up to traders to recognize that the standard of workmanship employed by the gas undertaking is the only one that can give satisfaction to the user, and further the development of gas sales. Local co-operation must tend to ensure that the public (and they are the only people really concerned) receive reliable apparatus fixed in a manner conducive to safe, economic, and efficient usage.

As a nation we claim to be progressive; and nowhere is this more apparent than in the gas industry. Progress cannot be achieved by Acts of Parliament alone, but rather by the acts of individuals who successfully combine together to work for the benefit of the community. What eventually benefits the community, must in the end benefit the individual. No one, possibly excepting lawyers, sighs for fresh legislation; but a simple set of regulations dealing with suitable methods of carcassing buildings, running gas services, and fixing gas apparatus should be introduced into all Building Acts and borough and urban council bye-laws. Fatalities have occurred, and will continue to occur, where the fixing of gas appliances is allowed to be carried out by the unskilled, without effective regulations and proper supervision. The harmless but very necessary water pipes and fittings throughout a house are governed by drastic rules and regulations, and are subject to inspection and approval by competent authority. How much more necessary, therefore, that gas should be subject to a simple but efficient set of regulations to protect the consumer and generally to safeguard the industry.

Again, one is continually meeting cases where first-rate apparatus is not giving satisfaction to the user, solely because the piping is inadequate for the duty to be performed. The difference in the initial cost of (say) $\frac{3}{8}$-in. and $\frac{1}{2}$-in. pipe, or $\frac{3}{4}$-in. and 1-in. barrel, is almost negligible, but efficiency can only be attained by careful consideration of the sizes requisite. In all cases where gas is taken into a building, the sizes of piping determined upon should allow for additional apparatus, which is sure to follow if the first installation is carried out in a proper manner. A 50 p.ct. margin may not be too much to allow for future requirements. At the present time there are large numbers of so-called gas heaters, which are marketed for the

purpose of heating an apartment where no flue exists, and which, to ensure portability, are connected to a gas point by rubber rings and flexible tubing. Apparatus of this nature, though the gas consumption per hour is only about 4 or 5 c.ft., cannot be considered hygienic, and will be regarded with a great deal of suspicion by all who have the best interests of the gas industry at heart. It is against faulty installation and the choice of unsuitable apparatus, that the consumer, who is necessarily ignorant of these points, should receive some measure of protection; and future legislation will provide an efficient safeguard.

The housing question will for some years to come be one of the most pressing political problems. The builder of to-day is casting around to discover any methods which will tend to reduce building costs without militating against domestic comfort. As a result of the active propaganda throughout the industry, it is becoming more and more recognized that gas provides an economical substitute for the coal grate where intermittent heating is required—such as in parlours, dining rooms, and bedrooms. Not only is gas a more economical fuel than coal for occasional use, but the builder is ready to appreciate the fact that considerable structural and financial savings can be effected by the elimination of ordinary coal-fire construction, and the substitution of narrow flues contained in the thickness of the external or cross walls. This system eliminates the large projecting chimney-breast incidental to the coal flue, thus giving a greater floor area—an important point where the sizes of rooms have to be cut-down to a minimum, owing to the present-day cost of building. These new and beneficial methods of flue construction have received the official approval of the Ministry of Health, the London County Council, and other public bodies.

It is not the writer's intention in these few remarks to offer any suggestions as to the best method of obtaining closer co-operation between the gas industry and the trader, builders' merchant, ironmonger, and builder, because this must be governed in a large measure by local conditions; but if it to some degree ventilates a subject on which many highly-qualified writers can express their opinions, the air would be cleared, and a spirit of mutual co-operation would be created, which would help to sound the knell of the coal grate, and improve generally the conditions under which we live.

RECOVERY OF PHENOL FROM EFFLUENTS.

Herr Peter Franke, of Essen, in "Das Gas und Wasserfach" for April 18, dealt with various methods of extracting phenol from the effluents of gas-works, coke-ovens, &c., with a view to eliminating the harm which it does to fisheries and agriculture. Of numerous processes which have been tried, he selected for mention only those which have been commercially proved, in which the costs are covered by the value of the phenol recovered, or even a profit is shown.

In dealing with considerable quantities of effluents, the separation of the phenol is based upon its solubility in benzole, its homologues, or trichlorethylene. An intimate mixture of the liquor containing the phenol with the solvent is essential, and the subsequent separation of the liquids is easy in view of the different specific gravities. The separation of the phenol from the benzole solution is effected by precipitation with caustic soda, or by heat.

Recovery from Alkaline Liquors.

In fig. 1 is shown an arrangement suitable for use in connection with the ammonia plant of a bye-product works. In

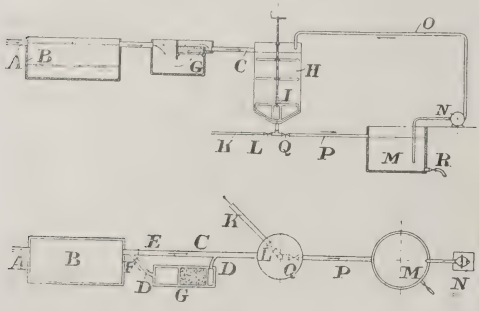


Fig. 1.

such a case it is necessary first to acidify the liquor to be treated, and, for this, waste resinous products are generally available. The waste liquor arrives by *a* into the settling basin *b*, in which solids, such as lime sludge, are deposited. The greater portion of the clear liquor flows through the pipe *c*, while a smaller part is trapped by the connection *d*. The quantity of the latter is regulated by the valves *e* and *f*, and it flows through the filter *g*, which contains the acid resins, from which it takes up sufficient acids to neutralize the main stream in *c*. The liquor, thus neutralized, reaches the washing and mixing apparatus *h*, which is provided with a stirring arrangement *i*. The washer is half full of benzole, and is filled up with the liquor, and the inlet then closed. By stirring for several minutes, an intimate mixture is effected, and the liquor subsequently separates-out at the bottom, while the benzole, which has dissolved the phenol out of it, remains on top. The latter stays in the washer, while the waste liquor is run-off through the pipe *k*.

From the collecting tank *m*, sodium hydroxide is raised, by means of a pump *n*, and by way of *o*, to the washer *h*. Here a quantity equal to that of the waste liquor treated is stirred for a few minutes with the benzole. The latter, thus freed from phenol, again separates-out on top, and the sodium hydroxide is run-off into the tank *m*, by way of the cock *q* and the pipe *p*. Part of the sodium hydroxide combines each time as sodium phenate; and, when this process is sufficiently advanced, the contents of *m* are run-off at *r*, and more sodium hydroxide is introduced. The sodium phenate can be disposed of to the chemical industry, and the only loss of benzole is due to any evaporation there may be, and any slight traces of solubility in water.

In order to save the slight cost of acidifying the waste liquor, it is suggested that the process may sometimes be applied to the ammoniacal liquor itself before this has been treated. In this way, also, considerably more phenol can be recovered.

Recovery as Crude Oil by Distillation.

The apparatus sketched in fig. 2 consists essentially of a distillation vat and several washing compartments, arranged

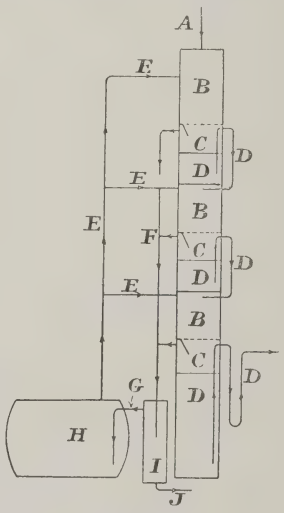


Fig. 2.

A. Liquor inlet.
B. Wood shavings.
C. Benzole.
D. Liquor.
E. Benzole vapours.
F. Phenol-benzole outlet.
G. Phenol-benzole overflow.
H. Distillation vat.
I. Separation tank.
J. Liquor outlet.

one above the other, with phenol separators. Each is divided into two spaces, the upper being filled with wood chips or other material, in which the benzole vapours come into contact with the liquor containing phenol, and the lower being that in which the liquor and the benzole separate from one another. The plant includes also a collecting separation tank, where any liquor which has gone through with the benzole can finally settle.

The liquor enters first into the top chamber, and comes into contact with the benzole vapours, which absorb the phenol. In the lower compartment, the benzole-phenol solution and the liquor separate, owing to their different specific gravities. The former runs-off by the central pipe to the collecting separation tank, while the liquor, still containing some phenol, runs into the second chamber, where the process is repeated. After passing the third chamber in the same way, the liquor is as good as cleared of phenol, and can be disposed of direct from here; and any of it that has passed over with the benzole to the collecting

tank will separate out there, and can be run-off at the bottom for disposal. The benzole-phenol solution passes by an overflow into the distillation vat, where the benzole is vaporized and returns to the process, while crude phenol oil only remains.

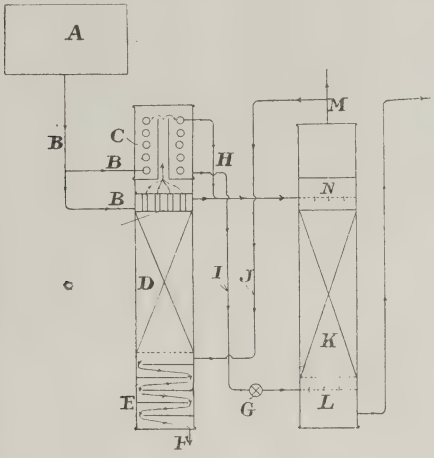


Fig. 3.

A. Elevated tank.
B. Liquor.
C. Condenser.
D. Packing with Raschig rings.
E. Distilling plant.
F. Phenol outlet.
G. Benzole pump.
H. Preheated liquor.
I. Benzole (fluid).
J. Phenol-benzole.
K. Mixer filled with Raschig rings.
L. Benzole inlet.
M. Ventilation.
N. Liquor inlet.

A Liquid Benzole Process.

Fig. 3 indicates the apparatus for a combined liquid and vapour process. The separation of the phenol from the benzole is done by heating, while the benzole is introduced to the liquor in liquid form. Before being mixed with the benzole, the liquor flows down from a high storage tank through a condenser and a dephlegmator. In this way it is warmed for the process of phenol extraction, which is thus expedited. By means of a pump, the benzole is introduced at the lower end of a mixing tank, which is fitted with Raschig rings or other packing, while the liquor enters at the top. With its lower specific gravity, the benzole rises, and the liquor moves in the opposite direction. Working in this way, a very efficient result is achieved, especially as the fresh benzole entering the mixer first comes into contact with the liquor when the latter has already given up most of its phenol.

The benzole, after taking-up the phenol, passes into a distillation apparatus, where it is vaporized, and from which the crude phenol oil is run off. The benzole vapour then passes through a space filled with Raschig rings, and a dephlegmator, where any remaining particles of phenol are retained. It is then condensed, and returned to the process.

Trichlorethylene.

The use of trichlorethylene, either in liquid or vaporous state, has the advantage over benzole and its homologues that it is not highly inflammable, and is not even slightly soluble in water, so that not even slight traces are lost in this way in the process. In coke-oven works, however, no doubt the benzole produced locally will be preferred. It has also been found on occasions that trichlorethylene in mixture with water gives rise to corrosive troubles, due to formation of free hydrochloric acid.

Payability.

The author estimates the payability of the processes on the basis of treating liquor containing 0·5 p.ct. of phenol. With a 90 p.ct. efficiency, 45 lbs. of crude phenol oil are recovered from 1000 gallons of effluent, requiring the vaporization of 300 gallons of benzole by about 0·27 ton of steam. On these figures, he considers the process quite profitable, having due regard to cost of wages, depreciation, &c., and that, far from being an added charge, it improves the showing of the bye-product plant.

INDUSTRY AND SMOKE ABATEMENT.

At the Annual Conference of the Royal Institute of Public Health, which was held at Brighton last week, Mrs. M. A. Cloudesley Brereton, in collaboration with Mr. Ian Macdonald Horobin, M.A. (Hon. Warden, Mansfield House, University Settlement), read a paper entitled "Industry and Smoke Abatement."

Industrial Smoke: The Next Step.

My view, says Mrs. Cloudesley Brereton, is that we cannot tackle the domestic smoke problem in any but a very gradual way. We can only concentrate on educational propaganda about smoke; leave the gas and electric industries to go on winning public favour; enlist the intelligent co-operation not only of doctors, but of architects and builders; and wait upon Science to solve the problems of large-scale production of a cheap free-burning smokeless solid fuel. Because we have to wait in this, does it follow that we should also wait to tackle industrial smoke, for which in many cases remedies are to hand? I think not. But let us, whatever we do, avoid making industry hostile to appeals for reform, by being deaf ourselves to the reasonable appeals of industry for caution.

Lord Newton's Smoke Abatement Committee drew a perfectly sound distinction between smoke from boiler furnaces and smoke from other manufacturing processes. Well over half the industrial smoke comes from the former source, and generally speaking this may be dealt with as a single problem, irrespective of the industry in which the steam-raising plant is used. It is not possible, however, to fix a definite limit to the amount of density of smoke permitted from boiler furnaces, which should be universally applicable, since the type of the existing plant, and the size and constancy of load, variously affect the possibilities of smoke prevention. Such measures as were contemplated in recent Smoke Abatement Bills are, therefore, the best that can be reasonably imposed—measures whereby an emission which "constitutes a nuisance" shall not entail a fine if the manufacturer is able to show "that he has used the best practicable means for preventing the nuisance, having regard to the cost and to local conditions and circumstances."

It might be profitable for the Minister of Health to invite the opinion of industries on a proposal to set a time limit to the operation of such regulations, after which they would be replaced by a definite and stringent standard of maximum smoke emission permissible from boiler plants, irrespective of cost and local conditions and circumstances. In other words, those firms whose boiler plants are at present not capable of preventing smoke as effectively as others would be given a definite period of so many years in which to adopt new plant, new methods, or special devices for the prevention of smoke.

I do not pretend to know how such a suggestion would be received by industry. My main point, indeed, is not to recommend that such measures should be taken, but that industry should be invited to co-operate with the Minister in offering advice as to what is and what is not practicable. The Ministry of Health is, I believe, alive to the necessity for consulting industry. I only stress the point because some zealous reformers are not. And such zealous reformers do harm.

The same principle of taking the views of industry is even more applicable to smoke from manufacturing processes other than steam raising. I would suggest:

(1) That the Minister of Health should appoint permanent committees composed of leading progressive manufacturers in individual industries (or groups of industries which can fairly be treated together) to advise him as to the minimum of smoke which it is practicable to emit by employment of efficient methods in reasonably up-to-date plant in the processes concerned.

(2) That a fuel expert of recognized standing be included, besides business men, on all such committees.

(3) That the minimum smoke emission practicable, as defined by these committees, should be scheduled by the Minister as maximum standards of permissible smoke emission.

(4) That legislation be enacted making it obligatory upon local smoke authorities, having power over larger areas than those responsible at present, to prosecute when these maximum standards of smoke emission are exceeded.

(5) That, as suggested in recent Bills, it should be a defence to show that the best practicable means had been taken to prevent emission of smoke in excess of the standards.

(6) That, for the benefit of manufacturers and the guidance of judges in prosecutions, the committees should be invited to draw-up instructions to show by what methods it is practicable to reduce smoke to the standards set up on their recommendation.

The spirit of this recommendation is, I am sure, a right one.

(7) That the Minister should further allow and encourage local authorities, in consultation with the local chambers of commerce, to set-up local committees representative of industry in their area; and that the principal functions of these committees should be to encourage local *voluntary* standards higher and more exacting than the national standards set-up by the Minister on the recommendation of the national committees.

If the problem of industrial smoke is approached along such lines, effective legislation should be practicable—not legislation that would impose new burdens upon industry at this unfitting moment, but legislation of a kind positively helpful to industrial progress.

SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

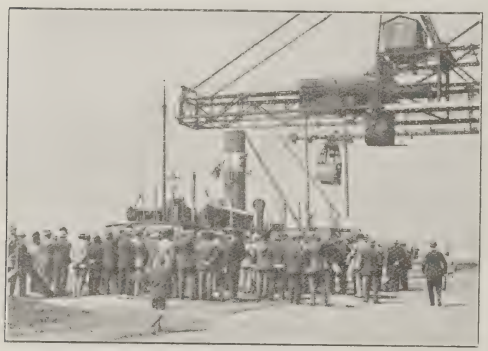
THE BOURNEMOUTH GAS AND WATER COMPANY.

The Summer Meeting of the Southern Association took place in Bournemouth last Friday, when a large number of members assembled to enjoy the hospitality of the Bournemouth Gas and Water Company, and to visit the works of their President, Mr. P. G. G. Moon, F.C.S. Perfect weather favoured the occasion, the hospitality was of a most generous order, and keen interest was taken in the bold construction work at Pitwines, Poole.

The rendezvous was the Square, at 10 a.m., whence the party were conveyed in motor coaches to Poole, traversing the Pitwines site and disembarking on the quay where coal is unloaded for the old works. It will be remembered that the Bournemouth Company acquired the undertaking of the Poole Gas and Coke Company in 1902, and in 1905 extended the harbour site to 3¼ acres.

THE WORKS.

The coal is unloaded by two bridge transporters. The original one, which was supplied by the Temperley Transporter Co. (now amalgamated with Sir Wm. Arrol & Co.) has a nominal capacity of 50 tons per hour, and has worked continuously since it was first erected in 1905. The operator sits in a fixed cabin, the grab being controlled and travelled by wire ropes. The second transporter was supplied by the Mitchell Conveyor Co. in 1922, and has a capacity of 100 tons per hour. It operates on a rather different principle, as the driver, instead of being in a fixed cabin, travels with the grab,



Mitchell Transporter at Work.

and thus has better control over the operations of the crane, while a further advantage is that the wire ropes required are much shorter than with the Temperley transporter.

The transporters have a span of 180 ft. over the coal store, and a cantilever span, over the public road and two railway lines, of 116 ft. They travel transversely across the coal storage ground and enable coal to be dumped upon and picked up from every portion of the area. The coal is lifted from the hold of the ship by means of grabs; and when both machines are working, a vessel can be unloaded in 10 hours, including all stoppages for greasing, trimming, &c. The transporters can deliver coal either from the ship or from the stock heap through the coal breakers and fillers to the gravity-bucket conveyors which convey it to the overhead bunkers in the retort houses.

The carbonizing plant consists of: (*a*) One house containing 100 23 in. by 16 in. by 21 ft. through retorts, equipped with De Brouwer charging and discharging machines. The capacity is 1½ million c.ft. per day. The coke is removed by a hot coke chain conveyor, and stored in ferro-concrete hoppers with a capacity of 280 tons. (*b*) Two houses containing three benches of Woodall-Duckham verticals, each bench having 24 retorts, 25 ft. long. The capacity of each bench is 1¾ million c.ft. per day. Two Bonecourt waste-heat boilers have been installed, with a capacity of 4200 lbs. of steam per hour.

The coke is brought from the vertical retort houses by gravity-bucket conveyors encircling the benches, and is screened and graded before being dumped into the storage hoppers. These have a capacity of 450 tons, making with the horizontal hoppers a total storage of 730 tons.

To deal with the coke required by the water gas plant and boilers, there is a Mitchell 3-ton radial cantilever crane with a radius of 70 ft. and a height of lift of 45 ft. The operating cabin of this crane travels with the load, and thus control is very much easier than from a fixed cabin on the framework. The crane puts the coke required by the water gas plant and boilers direct into overhead storage hoppers serving these plants, deals with the ashes from the retort houses, boilers, and water gas plant, and will also feed a loading station on the new cableway conveyor to Pitwines.

The coal handling plant and the radial crane are of outstanding interest, and received much comment from the visitors. Their attention was next called to a Scammell "Six-Wheeler" motor trailer, which ran quietly into the yard and with the minimum of fuss deposited its heavy load of coke in a neat stack on the ground. The trailer frame of this machine carries a long pressed-steel body mounted in trunnions at the rear; and the load is tipped by raising the body on the piston-rods of hydraulic

Scammell "Six-Wheeler" Unloading.

or oil-pressure cylinders, the power for which is developed by the motor engine through a suitable clutch and gearing. The "Six-Wheeler" has a capacity of 10 tons, and is used by the Bournemouth Company for transporting coal or coke to the Bourne Valley Station or the water-works.

An adjournment was soon made, by way of the new ropeway passage, to the Pitwines site, where the progressive policy of the Directorate and the ingenuity of their Engineer and the contractors are rapidly bringing to completion one of the finest gas-making stations in the country—on a site largely reclaimed from the sea for harbour works. Col. Harold Woodall, when Engineer to the Company, built the 2¾ million holder on the only clay he could find; and the piling which has been carried out to make extensive works possible on the site was a task requiring great skill and patience. Full details of this, as of the design of all the new plant, were included in the supplement which Mr. Moon gave to his Presidential Address at the Annual General Meeting on March 24 [see *ante* p. 117].

Large-scale drawings were posted up by every section of the plant, and the visitors were ably guided and fully informed on any matter by members of the Directorate, Mr. Moon, and his assistants and staff, who are to be cordially thanked for their services. Time was too short, however, for a thorough inspection of the many features; and it is hoped that an opportunity will one day be granted for another visit when the station is at work.

The Poole Works on the Left; the Pitwines Works on the Right.

PITWINES—NORTH-EAST ASPECT.
Showing the 15,000-ton coal store, the ropeway terminus, and the Woodall-Duckham verticals.

The 15,000-ton coal store, with its conveyor on a travelling gantry, was first viewed. At one corner the shuttering for the concrete of the terminal station of the cableway was in position. Here, automatic devices will tip the buckets into one of three hoppers—for coal, coke, or ashes. Next for inspection came the Woodall-Duckham verticals—capacity, over 2¾ million c.ft. a day. A new setting, not yet fired, offers the fullest opportunity for the examination of details of construction and mechanism; and the majority of the visitors made a tour of each stage, and on the charging level had the advantage of explanations of the latest developments from Sir Arthur Duckham himself. A new feature at ground level is extraction of the ashes from the hanging-bar producer grates by gear similar to that for coke extraction from the retorts.

One two-million Humphreys & Glasgow C.W.G. plant is in course of erection at the end of the main block of buildings. The "house" is very spacious, and it is probable that in due course the water gas plant from the Poole Station will be shifted into it. Automatic chargers and self-clinkering grates

LEFT TO RIGHT: Mr. Plumb, The Mayor of Bournemouth, Lt.-Col. H. W. Woodall, The Mayor of Christchurch, Sir Charles Jessel, The Mayor of Poole, Mr. E. Honoratus Lloyd, Sir Charles Morgan, Mr. P. G. G. Moon.

will be applied to the new units. The boiler house is adjacent; and the ash shaft between this and the C.W.G. house excited considerable comment. Alongside the boilers are the Dowson suction producers which supply the power house, so that the solid fuel using plants are grouped together.

The power and exhauster house is an admirable piece of work; and fortunately the engines were seen running—on town gas for the present. They form part of a large Keighley Gas Engine Company contract for producers, engines, dynamos, compressors, and auxiliaries, and are of the latest pattern with gas and water supply below ground level and visible cooling water feed. Two generating sets are complete, and the power section of the house has been designed for two more, besides the auxiliary plant. The main switchboard is not yet in place. The exhausters—three out of six by G. Waller & Sons, each of 125,000 c.ft. per hour, are installed at present—are on a platform nearly the full length of the house, and about one-third its total width. Three lines of mains are readily accessible between the platform and floor level. Over the power units runs a 2½-ton crane, and over the exhausters one of 1 ton capacity; and it was pointed out that a gap, which will be screened, has been left in the dividing wall between this house and the adjacent workshops. This opening is big enough to pass the largest single part of the power plant.

In these few notes an endeavour has been made to record the features which specially attracted attention, for the whole scheme was admirably dealt with by the President in his address.

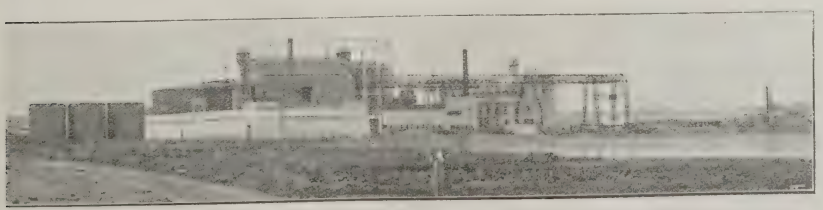
THE LUNCHEON.

Light refreshments having been served, the visitors made their way past the booster and purifier houses to the main entrance of the new site, where the motor coaches were waiting to convey them to the Branksome Towers Hotel. Here they were the guests at luncheon of the Chairman and Directors of the Bournemouth Gas and Water Company.

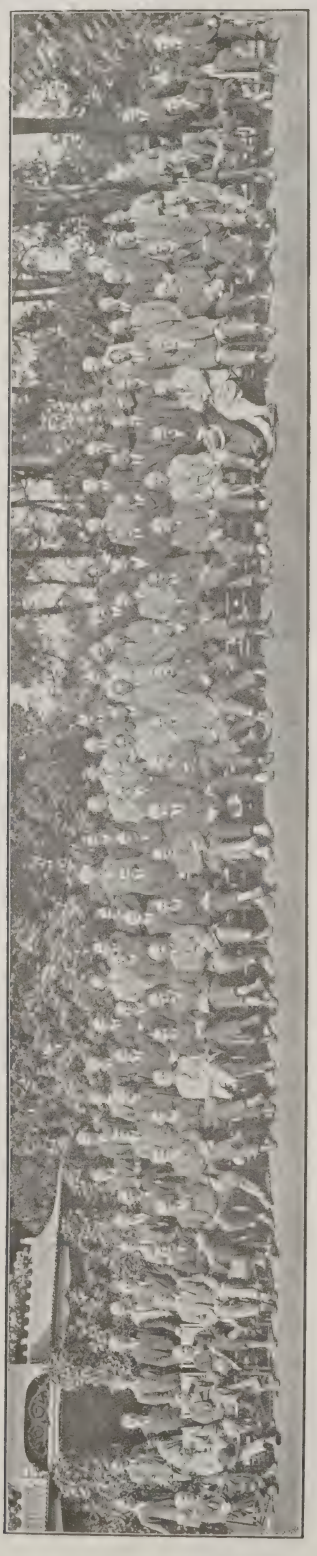
Mr. William Cash, F.C.A., was in the chair, supported by Sir Charles Morgan, C.B.E., M.Inst.C.E., Sir Charles J. Jessel, Bart., Col. H. Woodall, C.I.E., M.Inst.C.E., and Mr. E. Honoratus Lloyd, Directors of the Company. With them at the top table were their Worships the Mayors of Bournemouth, Poole, and Christchurch; the President of the Association, the Vice-President (Mr. R. Robertson, of Bristol), and the Secretary (Mr. H. C. Smith, of Tottenham); and Sir Arthur Duckham, K.C.B., Mr. Thomas Hardie (Chief Engineer of the Gas Light and Coke Company), and Mr. W. M. Mason (Manager of the "B.C.G.A."). The following were unfortunately prevented from attending: Mr. J. Ferguson Bell, the Presidents of the North British and Midland Associations, Dr. Lewis Bailey (Chief Inspector of Alkali Works), Mr. F. Napier Sutton, and Mr. W. B. Leech (Engineer of the Beckton Station). The Loyal Toast was honoured at the call of the Chairman.

POINTS FROM THE SPEECHES.

The CHAIRMAN proposed "The Southern District Association of Gas Engineers and Managers." To them he extended a hearty welcome to Bournemouth, and on behalf of the assembled company voiced appreciation of the presence of the Mayors of Bournemouth, Poole, and Christchurch. Nowadays the gas engineer had to be a man of high efficiency and training. Besides gas-making, his duties demanded a knowledge of all branches of mechanical and constructional engineering, and of chemistry and electricity. On the administrative side he had to deal not only with his men but with the consumers; and commercial training was necessary for buying and selling such things as coke, sulphate of ammonia, and tar. Added to this at Bournemouth was water engineering, with its many problems. He sometimes wondered the Engineer did not get confused, fill his holders with water, put his gas through sand filters, soften the gas, and attempt to purify the water with oxide. [Laughter.] These Association meetings gave opportunities for the exchange of ideas and the examination of new processes. He had been interested to note that Mr. Moon had touched on several processes of purification, oil cracking, &c., in his presidential address. With the toast he coupled the name of Mr. Moon. The Directors were highly gratified



and the Intervening Streets through which the Ropeway Conveyor will run.



THE LUNCHEON PARTY ENTERTAINED AT THE BRANKSOME TOWERS HOTEL.

at his being elected President of the Association. The greatest credit was due to him for his design and planning of the new works—carried out without the aid of a consulting engineer. Mr. Cash made appreciative references to Col. Woodall, whose presence on the Board was of such advantage to them; and to Sir Arthur Duckham, once on the staff of the Company—they felt proud that he was with them that day. They were proud, too, that the Engineers of Croydon, Barnet, and Worthing were old Bournemouth men. They had always had first-class officers.

The PRESIDENT replied. On behalf of the Southern Association he thanked the Chairman and Directors for their great hospitality. In his opinion these meetings were able to be of value because the gas industry was not hampered by internal competition, and what he might call the territorial limitations of gas companies allowed free discussion on methods and efficiencies. Gas engineers realized that they were all together, not merely to sell gas, but to render public service. He appreciated the broad outlook of his Directors, who understood that gas engineers could not get on just by watching their holders go up, but that they had to go about and discuss things elsewhere.

Mr. R. ROBERTSON, of Bristol (Vice-President of the Association), gave the toast of "The Local Boroughs;" and, incidentally, amused the company. On their busman's holiday, he said, they had been trying to find the secret of success which attended the Bournemouth undertaking; and he thought they should put the Bournemouth Company on to show the electricity industry how to develop their business without a subsidy. In eulogizing the boroughs of Bournemouth, Christchurch, and Poole, he found a point of similarity between the latter two—at Christchurch the Priory, at Poole the gas-works! Both were responsible for the dissemination of light; and, if he might say so, both had something to do with heat—one showed how to produce it, the other how to avoid it.

Their Worships the MAYORS responded; the Mayor of Bournemouth congratulating the Company upon their enterprise. In his younger days the site of the Pitwines Works was nothing but harbour mud. His Worship of Christchurch remarked that a few years ago they had had the good sense to change from electricity to gas, and they had no reason to complain. The Mayor of Poole said that the Company provided one of the links between the boroughs. Poole had fine opportunities for expansion, and one day it might be a larger consumer of gas than Bournemouth.

The Chairman with Engineers of Companies in which he is interested.

LEFT TO RIGHT: Mr. P. G. G. Moon, Mr. S. O. Stephenson (Worthing), Mr. Wm. Cash, Mr. W. J. Sandeman (Croydon), Mr. A. Caddick (Croydon), Mr. Hasledine (Barnet).

Sir ARTHUR DUCKHAM, K.C.B., proposed "The Bournemouth Gas and Water Company." As an old Bournemouth man, it gave him great pleasure to give the health of the Company; and he was delighted to see present two of his old chiefs—Col. Harold Woodall and Mr. T. S. F. Gibson. He considered that the Bournemouth Company had done more than any other for the progress of the industry. Two points of their policy especially struck him. The first was that they had led the way in establishing the new relationship between gas companies and their consumers, which had at one time been very different from what it was now. The second point was that they had always shown great courage and a wealth of ideas. He felt sure that Mr. Moon would have one of the finest works in the country.

Mr. WILLIAM CASH responded for the Company. Kind things had been said about the Board of Directors, which, he confessed, comprised experts in almost every relevant direction. In this regard Mr. Cash mentioned specially Sir Charles Morgan, a great engineer, Sir Charles Jessel, financier and gas administrator, Mr. Honoratus Lloyd, K.C., and Col. Harold Woodall, with his local knowledge. The Company's great problem was to meet the growth in the demand for gas. In 1894, their output was 208 million c.ft.; in 1904, 527 millions; in 1914, 1016 millions; in 1924, 1791 millions. In 1904 they had 14,149 consumers, and in 1924 36,362. The charge on the capital was, at present, no more than pre-war. After mentioning the Company's co-partnership scheme and their service of the consumer, Mr. Cash concluded with a reference to the charms of Bournemouth and the adjacent boroughs.

Mr. MOON, at the close of luncheon, announced that in the course of the afternoon's drive they would pass the Swanage Gas and Elec-

tricity Works—an excellent example of the joint supply of the two commodities. He pointed out that since the inception of joint working there had been an increase of 117 p.ct. in the consumption of electricity, and at the same time an increase in gas consumption.

The band of the Bournemouth Gas and Water Company played, on the lawn of the hotel, an excellent programme of music during and after luncheon; and a photograph of the party was taken before leaving for the drive. The latter, in the perfect summer weather which favoured the visit, was to Swanage, and led by Corfe Castle and through a countryside full of natural features of interest.

It is needless to say that the visit was greatly enjoyed by all present, and that many thanks are due to the Bournemouth Gas and Water Company, to Mr. Moon, Mr. Smith, and all who worked to make it a success; and the large attendance of members and visitors must have been gratifying to the hosts, especially in view of the visit's immediate proximity to "Institution Week."

CALORIFIC VALUE AND GAS TESTING.

By NORTON H. HUMPHRYS.

The observations under this heading (see *ante*, p. 528) comprise items with which all who have had practical experience in manufacturing and supplying gas subject to the provisions of the Gas Regulation Act are likely cordially to agree; but also some that may be regarded as of doubtful character. Objection will not be made to the soundness of a proposition that the gas sent out from any one works should be uniform in calorific value and specific gravity (to which the supply pressure at the inlet of the consumer's meter might be added), or to the inadequacy of official tests, no doubt correctly conducted, but so far apart that they fail to indicate a fair average, and may consequently tell against uniformity. At an early stage of experience in carrying-out the requirements of the 1920 Act, on a small works where the official visits were limited to four per annum, the fact was evident that the official annual average might differ by as much as ten units from the average of the works bi-weekly tests, a sufficient margin to cause undeserved stigma of liability to penalty; and that, under such conditions, the costly and cumbersome official calorimeter set is a white elephant, so far as official use is concerned. That it will be a great acquisition to an intelligent and energetic manager is another story. Better and more satisfactory results could be secured by the weekly or bi-weekly use of a simple, self-contained, and portable direct-reading apparatus that could be operated by any intelligent lad, of which appliances several varieties, claimed to be accurate within 2 p.ct., are now on the market. The average of the daily readings obtained from an instrument of this class is at least as near the mark as the official four-item annual average.

Where is the need for a costly and elaborate set of apparatus, if the operation procedure is such that the results obtained by it are not within 2 p.ct. of a correct presentment?

As a means of securing information respecting the extent of amplitude between maxima and minima, also as affording a portable and comprehensive record covering a period of years, which may be placed on view in the office or board-room, the graph illustrated on page 529 can be highly recommended. Weekly readings are readily included on a sheet of moderate dimensions, covering the entire year's operations; and three or more years may be shown on the same chart, by the use of different coloured inks. The facility for comparison is far greater than can be afforded by paged record, and a useful addition is a blank space at the foot, for entry of averages, coal used, and other details.

According to personal experience, a jump of 40 B.Th.U. or more between the quality one day and the next is both undesirable and avoidable. I have never met the obsequious consumer who takes off his hat and expresses polite gratitude for a reduction of 100 B.Th.U. or so in the quality of his gas supply; but have reason to believe that fluctuations extending to 40 B.Th.U. or more create dissatisfaction that is none the less real if not definitely stated to the clerk at the complaint counter or to the meter inspector. Many consumers have an innate dislike of making complaint, or believe the same to be useless, but they are impressed with the difficulty as an inherent and unavoidable defect peculiar to town gas, and business is thus prejudiced.

In exceptional circumstances, an undertaking "under excellent management" may be compelled to supply some 30 B.Th.U. below the declared value for a sufficient time to necessitate a corresponding swing of the pendulum in the other direction in order to recover the average. But that such is a fair generalization as applied to everyday practice throughout the country, I do not believe; having found that an output of 25 million c.ft. per annum can be comfortably worked, year in, year out, within a 25 B.Th.U. margin, which, as experience accumulates, will doubtless be reduced. The facilities for uniformity increase with the scale of operation. Any engineer, excellent or otherwise, who exceeds 20 to 25 B.Th.U. may be advised to give full attention to the causes of variation.

There is room for wide differences of opinion respecting the need for, or the advantages obtainable by, the adoption of one compulsory standard of calorific value throughout the country. Its advocates occupy an ambiguous position. Some seem to regard it as a new thing, forgetting that the gas industry had settled down for at least 25 years prior to 1920 to a uniform 14 candle (No. 2 "Metropolitan" burner) illuminating power, and that a national standard has thus been afforded a prolonged trial. For various reasons some exceptions existed, but the extent to which the 14 candle standard was adopted amply sufficed to illustrate the advantages or defects inherent in one fixed standard. Among other things, a leading feature in the Gas Regulation Act, 1920, is an advance on the uniform quality, in response to complaints as to the limitations thereby involved, in the way of free selection of materials and processes, towards giving the consumer the best possible value at the least cost. With continual increase both in extent and variety of the available materials and processes, this objection is not less important in 1925 than 1919. The 14 candle quality was arraigned both at the works and on the district. The works manager had one hand tied behind him; and 14 candle was not necessarily the best for the consumer. The Act introduced full liberty in respect of both these matters, not only at the start, but for alteration, if thought desirable, at reasonable intervals. Up to the present, undertakings coming under the 1920 Act have followed the line of least resistance, for the greater part, and continued to work without important alteration to existing practice, not accepting a declared value that varies from 14 candle (considered to be equivalent to 500 B.Th.U.) by more than 10 p.ct. One reason may be that gas undertakings were for the most part crippled by war conditions and needed to recover normal status before considering important changes; or thought that the wiser plan was to await better facilities in the matters of material and labour. Many who are inclined to take advantage of the new regulations do not at present feel at liberty to do so, and the majority who retain practically the former quality would be ill-advised to discard lightly the wider door opened by the 1920 Act; for, when clear of present embarrassment, they may have opportunity for full consideration of the value that would secure the greatest advantage both to their customers and to themselves.

If there exists such a thing as one fixed value that is equally desirable under all the various conditions of gas consumption, it will gradually acquire increased importance and prominence as the survival of the fittest; but the abandonment of all the benefits to the industry which are attendant on the right to change the declared value at any time is a heavy price to pay for the doubtful advantages that would follow the adoption of a national standard, and which, by the way, were not strongly in evidence at any time previous to 1920—nor has anything to the contrary been specially noticeable at a later period.

The clauses in the 1920 Act were not intended for the exclusive assistance of the undertakers. The interests of the consumers were viewed in correct perspective. While there is little difficulty in making out a case, on their behalf, in favour of full liberty, it is not such an easy matter to plead the cause of a national standard. The authors of the 1920 Act correctly assumed that, as business men, the directors of gas undertakings, so far from seeking to force an unacceptable value which for other reasons might be desirable, would look for one that would promote sales by giving general satisfaction. The introduction of one fixed value throughout the country would in many cases call for more extensive changes in the way of replacing existing pipes, fittings, and burners than have been necessitated by the operation of the 1920 Act. Consumers would not be willing to bear the expense. Many gas undertakings would be forced to accept responsibility for large outlay which did not carry corresponding advantage, and might result in actual loss.

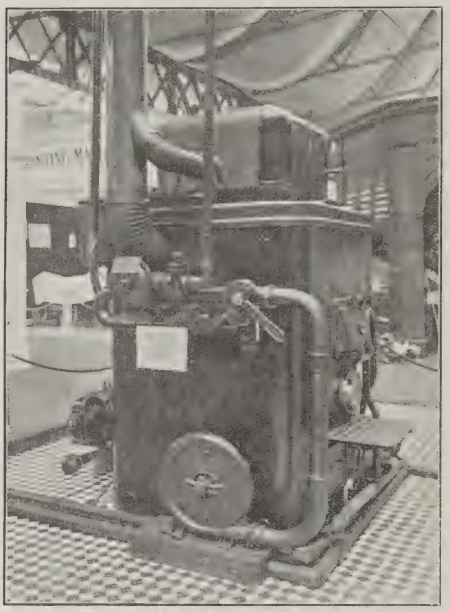
Much has been said about the selection of any Tom, Dick, or Harry as capable of efficiently carrying out the duties of an official gas examiner, with little or no regard to qualification. To quote one instance, a point was made of the selection of the owner and occupier of a small public house. The fact that the accepted candidate was a retired master gas apparatus erector, who, after many years of travelling, desired to settle down in quiet, but possessed an intimate knowledge of the gas industry and had at times taken entire charge of a gas-works, was evidently unknown to the objector. On the whole the appointed officials appear to have discharged their duties to the satisfaction of all parties concerned; and I have not heard of any returns being disputed on grounds of incompetence or negligence. The only objections hitherto published take the form of irresponsible comment by aggrieved parties who have experienced trouble with the gas supply, due to local defects, or, after a few years' enjoyment of a "slow" meter, have been provided with a substitute that complies with the requirements of the Sales of Gas Acts.

Smoke Pollution and the Nations.—The Czechoslovakian Academy of Agriculture have put a proposal before the International Institute of Agriculture at Rome for the establishment of an international commission to study legal and other measures for the prevention of damage due to smoke.

PRINTERS' EXHIBITION.

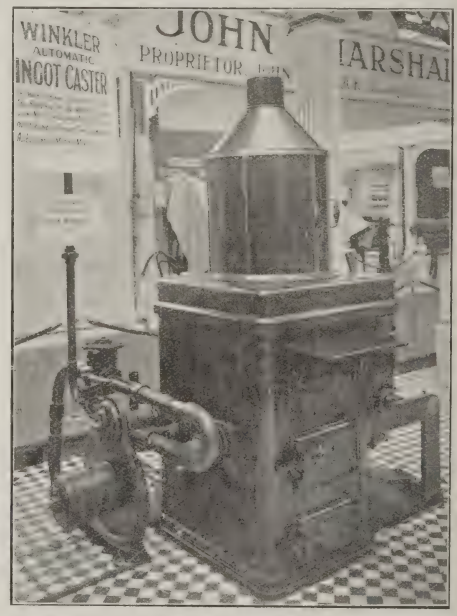
Use of Gas in the Trade.

The ordinary member of the general public cannot help but be surprised at the scope of the printing trades. There is no industry which has developed more rapidly in recent years than the printing industry; and Britain does not lag behind in this respect. It is not necessary here to go into any detail in connection with this specialized trade; but it is interesting to note, from the point of view of our own gas industry, that the printing trade has been almost fully converted to the use of gas wherever the employment of that fuel is possible in their industrial processes. It is also interesting that some of the most recent advances in printing machinery have incorporated, where possible, gas firing equipment, and that the literature supplied by such makers of complicated machinery includes accounts of the advantages of the use of gas on their machines.



The Winkler Automatic Casting Machine.

It is not generally realized that the printing trade in London has been converted to the use of gas. There were on view at the Printers' Exhibition, recently held at the Royal Agricultural Hall, the latest applications of gas in the printing trade. Practically the whole of this development has occurred during the last three years; and this has been made possible by demonstrating that gas can be applied to large-scale metal melting with enormous advantages over solid fuel, and by introducing equipment which requires for the same work done anything from 20 to 50 p.ct. less gas than was previously the case.

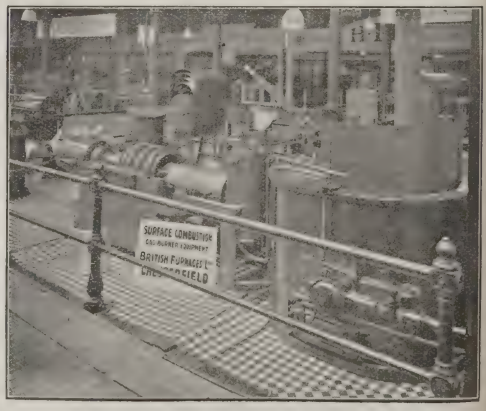


The Winkler Automatic Ingot Caster.

On the stand of Messrs. W. J. Light & Co., of Nos. 36-38, Whitefriars Street, London, E.C. 4, were the Winkler automatic casting machines, which are claimed to have the biggest outputs of any appliances on the market. Metal was being melted and cast at the rate of 200 lbs. of stereotype per minute, which is 33 p.ct. above the normal capacity of the machines. The gas consumption on this furnace is 570 c.ft. per hour during the working period of 6 hours, and 60 c.ft. per hour during the rest of the 24 hours when the metal is kept in a molten condition. The pot has a capacity of 2 tons of metal; and this quantity is melted-down, and raised to a temperature of 600° Fahr. in 1 hour from cold. The gas consumptions on this furnace can be taken as being 1 c.ft. for 10 lbs. of metal melted during the working period, and 1 c.ft. for each 6 lbs. melted when the gas consumption during the 18-hour holding period is taken into account. The furnaces are well insulated, and are heated by means of burner equipment supplied by British Furnaces Limited, of Chesterfield; the gas being at town pressure, and the air at 12 in. pressure.

Another piece of equipment shown in actual operation on the same stand was the ingot caster. Similar results are obtained

A Stand showing Three Gas-Fired Furnaces.



The Pony Autoplate.

by means of gas to those obtained from the automatic casting machine. The capacity of the pot is 900 lbs., and it has a bottom discharge. It is claimed that this furnace has the highest output of ingots of any caster on the market.

All plant on this stand having gas-fired equipment was sold on the first day of the exhibition, and further orders have been received from printing offices in Glasgow, Cardiff, Leicester, and Blackpool.

Another of the leading stands showing printing machinery which requires furnace equipment was that of the Linotype and Machinery Company, Ltd., of No. 9, Kingsway, London, W.C. 1. This Company supplied Junior and Senior Autotype machines, and they demonstrated the use of the "Pony" autoplate machine. This equipment was also sold on the first day of the exhibition, and others are on order. Similar efficiencies are obtainable on this autoplate machine to those on the Winkler machine.

The following is a list of some of the newspapers and printing offices in which British Furnaces equipment has been installed: "Daily Express," "Daily Chronicle" (London and Leeds), "Daily News," "The Star," "Daily Mirror," "Daily Sketch," "Evening Standard," "Daily Sketch" (new buildings), Amalgamated Press, St. Clement's Press, Dellagana & Co., Cassell, Ltd., Wm. Clowes & Sons, "Morning Post," "Manchester Guardian," Crabtree & Sons, Leeds, "Sydney Morning Herald," Bell Punch Printing Company, Ltd., "Brighton Herald," "Yorkshire Evening Argus," and "Glasgow Evening News."

There are over 100 installations at the present time in London alone. Most of the equipment consists of specialized burners to which are attached patented inspirators, in which the automatic mixing of theoretical proportions of air and gas is ensured. The equipment requires gas at town pressure, and air from fan pressure. One concern alone in London is saving over 300,000 c.ft. of gas per month in its equipment, as compared with previous apparatus in use; and there has been no case of a cracked pot since the installation of the surface combustion principle. This has brought about a saving in this particular firm's case of about £2000 a year. In the majority of instances, however, the conversion has been made from solid fuel to gas, as few concerns had previously used gas in their processes.

GENERAL SALES PROPAGANDA.

By H. D. MADDEN, Engineer and Manager of the Cardiff Gas Company.

[A Paper before the Wales and Monmouthshire District Institution of Gas Engineers, May 28.]

When our President approached me in reference to a communication for this meeting, I had some diffidence in the choice of subject, but ultimately decided on a paper that would deal with showrooms and the value of publicity and propaganda by the judicious use of such prominently placed premises.

In the first place, the practice has been, and rightly so, to have the gas offices and showrooms in the principal thoroughfares of the town, and to provide the most attractive windows for the display of fittings and general gas-consuming apparatus. The ultimate object of this provision and display is largely, and more often solely, to increase the sales of gas; and it is noteworthy how effective these measures are throughout the country.

Are we content with the present-day business and uses of the showrooms, or shall we ask whether there are potentialities worthy of consideration and development? Unhesitatingly I answer that there are. In the first place, no gas-consuming apparatus should be shown or offered for sale unless it has first been tested and found eminently suitable and efficient in use with the quality of gas supplied to the district. The types should be carefully tested under conditions of pressure, with the actual gas provided; and this should rigorously be kept to a standard calorific value, and regular specific gravity and composition. With care exercised in manufacture, it is possible to reduce to negligible factor figures the limit of deviation from the predetermined values. Recognizing this, the Cardiff Gas Company recently arranged a physical laboratory wherein all domestic and industrial appliances are tested and carefully examined. We are thus able to deal with problems in more exact ways. Moreover, the outdoor staff are afforded every facility to visit this laboratory and gain first-hand knowledge of the methods of testing and the results obtained.

Give the salesman the best and most efficient apparatus, and eliminate all appliances which primarily may appear cheap, but ultimately prove troublesome and inefficient, and thereby cause annoyance, and result in dissatisfied consumers.

The showroom should be the place where the consumer can always call for advice and help, meeting salesmen he knows and who have his full confidence. Remember, also, that consumers call there to pay their gas accounts. If a friendly and good spirit prevails between the officials and the consumers, the company and the industry benefit. Generally speaking, this spirit of service and goodwill does strongly exist, and is being fostered and furthered by the salesmen's meetings and the Junior Gas Associations. Both are doing excellent work in this direction, and also in the education and technical advancement of sales staffs—most necessary factors to-day.

Every employee of the gas company who meets consumers is a potential commercial traveller for the company he represents, be he collector, inspector, or gasfitter; and it is vitally important for the industry that the men in these branches should be carefully educated, trained, and equipped with a sound knowledge of the application of the products the undertaking manufactures. At school we used to write out the phrase "Knowledge is Power"; and this can be applied to the staffs of gas undertakings. Widen the view-point, and give the gasfitters, foremen, inspectors, &c., facilities to see how the gas is made, the care taken in its production and purification, how and why it is tested, and the bearing on its use and application. If this is done, it will be found that the outdoor staff will respond, and take a great interest in their daily routine, to the greater satisfaction of the consumer, and the ultimate benefit of the undertaking. In other words, give them a wider interest than the common round and daily task. Consider the human element, and make them interested and enthusiastic gas men. At the same time offer scope and encouragement to the individual.

In Cardiff, my Directors have tried this. Arrangements were made for the outdoor staff to visit the works in groups, and see the actual manufacturing processes, supplemented by a series of lantern-slide lectures throughout the winter months. These lectures dealt with raw coal, manufacture of gas, production of coke and sulphate, &c., and finally with the application of gas to domestic and industrial use. Several members of this District Association have attended some of the lectures, and will bear out the large enthusiastic attendances, the great interest taken, and the knowledge gained.

In this preamble it has been my desire to indicate that the fullest possible use of showrooms and propaganda sales work cannot be made unless the outdoor staffs have had good opportunities of learning of the application of the commodities provided by their respective undertakings. It will be found that acquired wider knowledge arouses in them enthusiasm and strong belief in the industry they serve.

Essentially the uses of gas are of primary importance, and should be at the fingers' ends of every member who has to meet the consumer in any capacity. There is, however, another side, products—*viz.*, coke, sulphate, &c. Examine the published balance-sheets of any undertaking. It will be noted that the revenue from coke takes a very important place; but does it show the figure we should like to see? The answer is in the negative.

Coke has very wrongly been considered a "Cinderella" among fuels. Why? Because we have not given it the attention it deserves or the publicity it warrants. Generally speaking, it has been sold in its raw state. The charges against the sales of the gas itself are very heavy, but coke, the ideal smokeless fuel, when properly prepared, has received in the past but scant attention. The charges against it are very small, and chiefly confined to the costs of loading; nothing, or practically nothing, being chargeable to its preparation or development. And then wonder is expressed at the position to-day!

Manufacture the best coke possible by selected and blended coals, and then give it publicity in the offices and showrooms. Let every consumer who comes in, whatever his business, see an exhibition of clean, good coke, in graded sizes for all applications, put up in attractive form, with proper literature as to its uses ready to hand. It will then begin to sell itself. Stress, however, must be laid on its exhibited appearance—the samples should be clean, well housed, and attractive to the eye. This method will do much to popularize, and further the uses of, coke for domestic and other work; and if carefully handled, it will compete with, and largely take the place of, anthracite in closed stoves and water-heating apparatus. It is astonishing how effectual is this form of publicity; but the showroom staffs must be in possession of correct knowledge regarding the suitability and uses of the different graded sizes, and be able to advise the consumer intelligently.

For the past year we have made this a point in our lectures, and have utilized our five showrooms and offices to exhibit the graded sizes as effectively as possible. From our experience, this publicity has been eminently successful in popularizing and stimulating the local sales of coke for many divergent purposes.

Since adopting this policy, we have taken a large number of orders in the showrooms, by reason of the publicity given to coke. Fig. 1 indicates an all-coke window at one of our offices, showing the fuels, methods of use, and appliances, both domestic and industrial.

Experience has already shown that local sales can be largely stimulated, and that the showrooms can enormously assist the sales of coke, and tend to put this valuable fuel and asset in a much higher and firmer position. The same may be said of the co-operation of the showrooms in giving publicity to the

FIG. 1.—AN ALL-COKE WINDOW.

sales and uses of sulphate; but the staff must have some intelligent knowledge of the subject. Recently my Company offered neutral dry sulphate in 7-lb. linen bags, with the instructions for use printed on the back. Prominence was given to the product in all showrooms; and the result was gratifying. In a few weeks over 1500 individual sales were made, in addition to many inquiries. Publicity brought this valuable fertilizer to the eye of the public; and they purchased heavily locally. The prominence given has also brought us inquiries for small quantities of one and two ton lots from small-holders many miles away. In addition there were, in that period, a large number of inquiries for information and literature, which will probably mature. In the town and surrounding districts, amateur gardeners, farmers, and others have awakened to the fact that gas companies make this splendid fertilizer; and the goodwill of our business can also enter into their gardening pursuits, if the showrooms make it possible. There is a still wider local field for this commodity in the form of lawn sand, which will find a ready sale in most of the towns and districts where there are large numbers of small grass lawns to the residences.

In moving among even educated people, it is appalling to find the ignorance displayed in conversation relative to the great services the industry renders to the country and in the homestead. The extravagant views held by the unthinking public (they have never mentally advanced beyond the lighting stage) regarding the expected uses and ultimate powers of electrical energy, would make even the most hardened electrical salesman blush. Propaganda by newspaper advertisement is good, but publicity in the offices and showrooms is better, more persistent, and lasting. Slowly but surely the public are realizing that our sister industry has a relative and wonderful position in the world, but also that the gas industry is filling an important place in our national and home life which no method of electrical application can ever hope to displace without leading to national danger and disaster.

Conservation of coal, the constructive distillation of coal for products for national requirements, heating, agriculture, road-making, and also defence—and, more important still, the 80 p.ct. thermal efficiency figure of the gas industry's method of coal usage—should be given the utmost publicity at all times in every office at which a gas consumer calls. Fig. 3 illustrates a case—we have one in each office and showroom—by which we keep this important fact before the public eye. Residual products of our industry's processes of constructive distillation of coal are exhibited.

FIG. 2.—SHOWROOM PUBLICITY.

Fig. 3.—A Show-Case of Gas Products.

Remember that in propaganda work you must keep on telling and hammering-in the facts until the public get an opinion firmly established in their minds. The British public have not yet realized that electric energy production yields at its best practice only 19 p.ct. of the total energy of the original coal used, with no residuals except ashes, and that normally only 10 p.ct. of the total useful heat of the coal is available for the use of the consumer. The truth regarding national coal conservation should receive its meed of publicity by showroom propaganda.

Then again, there is the work of public education regarding the matter of smoke abatement. The offices and showrooms can exert a powerful influence in forming public opinion on this important matter; and I think this is a subject in which the gas industry plays the leading part. The public have not yet mentally visualized this fact and the important value of increased sunshine, though, by the tremendous appreciation and the growing uses of gas and coke, it is evident there is an awakening in this direction, if partly with the object of solving some of the domestic problems. There is a direct relationship between smokeless towns and individual health; and the public will awaken to this fact if we give them the opportunity to learn, by persistent propaganda in our offices and showrooms, aided by intelligent advertising work. Fig. 4 shows an interested crowd at our Queen Street Office—a crowd indicative of several weeks' interest in our special line of propaganda work.

The interpretation is, therefore: Make your showrooms miniature Wembley gas shows, and, as the Americans say, "tell the world" the manifold services that the gas industry can render to the nation in the conservation of our coal, and the application of gas to domestic, industrial, gardening, agricultural, and road-making pursuits, and also the many other directions wherein we can render service, in the best possible sense of the word, to the public we serve.

Fig. 4.—Outside the Queen Street Office, Cardiff.

The salesman in the office must be trained to be the "Fidus Achates" of the consumer in every possible direction; and the showrooms and offices, coupled with the intelligent knowledge and equipment of the salesmen—a knowledge which the industry itself can and must provide—are a great asset to this end. Some may say this policy is only possible for large undertakings. I state definitely that publicity and propaganda for the sales of gas and products are possible for, and equally vital to the best interests and advancement of, any undertaking, be it small, large, or medium in size. Individual undertakings should draw upon such organizations as the British Commercial Gas Association, the National Gas Council, and the British Sulphate of Ammonia Federation, for the help, guidance, and assistance which they may require in the furtherance of their sales. Though these organizations do magnificent work, and are basic resources, they cannot be expected to do the detail work of local publicity and propaganda, which must necessarily fall to the lot of the individual undertaking. All should co-operate in local publicity.

Discussion.

The PRESIDENT (Mr. W. H. Johns, of Swansea) said the paper had been very interesting, and offered ample scope for discussion by managers of works of all sizes.

Mr. J. H. CANNING (Newport) said Mr. Madden had again made them his debtor by a paper, the chief merit of which was that the "preacher practised what he preached." There was nothing the author recommended to them for their consideration which he had not put into effect very successfully at Cardiff. He had fairly exhaustively gone over the whole question of general sales propaganda as regards gas, coke, and other residuals; and it would be impossible, to deal with the paper in detail. He would like, however, to pick out one or two salient points, as matter for emphasis rather than discussion. The importance had been stressed of providing the most attractive showrooms for the display of fittings; and his (the speaker's) own experience backed this up. The more attractive they could make the window, the better would be the results. It was found at Newport that, when they could arrange a "live" or moving exhibit, it had a more pronounced effect than anything else in attracting the public. The paper really, he thought, might be summed-up in one brief sentence—the education of the public and the education of the staff. Upon these two points depended the success or otherwise of the undertaking. The author very rightly said that the general public, though they had been using gas for something like a century, were profoundly ignorant of its modern developments, and were consequently rather apt to be taken by the electricity propaganda. Gas people should not hesitate to keep on drumming into the public the many good points of gas, because no success in advertising could be obtained without constant repetition and perseverance. These were the great elements of success in advertising. The author had given them excellent advice with regard to the sale of coke; and the success that had been attained at Cardiff in this respect had been most gratifying. It seemed to him that they could all to a large extent, by following the advice given, promote their coke sales. By grading the coke, and by making the public aware of its vast possibilities, they could sell a great deal more of it in their districts than they were doing at the present time.

LOCAL EXHIBITIONS.

With regard to propaganda and advertising, there was one matter which Mr. Madden had not specifically included, and that was local exhibitions. At Newport much benefit had been derived from taking part in the travelling exhibitions which came along from time to time, and sometimes arranging purely gas exhibitions. Certainly this had had the effect of promoting sales. It was true that on several occasions their electrical competitors had exhibited under the same roof; but this was all to the good. Where the public had an opportunity of comparing the services rendered by both industries, gas people need have no fear whatever of the ultimate result. Some of them had been present a few days previously at the opening of a very interesting exhibition promoted by Mr. Jackson at Neath; and this, he was glad to learn, was giving excellent returns, in good attendances and large sales.

POLITICAL PROPAGANDA.

At the present time they had to face a particularly powerful phase of what one might call political propaganda in favour of their competitors. He did not think there was any need to go into this in detail. They all knew quite well what not only this Government, but two others he believed (all the political parties, in fact), had put forward as being a remedy for some of the existing social ills—namely, the granting of an enormous subsidy to their competitors, on the plea that the supply of cheap electrical energy all over the country would bring about a restoration of trade. He ventured to assert emphatically that no development of the electrical resources of this country would ever secure such a result, and that the present depression in trade arose from deeper-seated causes which were well known to those in power; but to put it plainly, they had not got the honesty to tell the public what these causes were. Unfortunately, to-day they had very few Statesmen and very many politicians; and there was a vast difference between the two. One of the chief arguments in favour of the development of cheap electricity in this country was that other people had developed their electrical resources, and consequently this country should do so. The truth was that, in general, electricity had only been widely developed in countries where considerable water power was available and at the same time coal was dear. In this country there was not the water power available, and coal was comparatively cheap; so that the conditions were quite different. One could well imagine that, in a country where

coal cost anything from £3 to £5 a ton, and water power was at hand, considerable economy could be effected by electrification; but in this country, where the only source of electrical energy was coal, and taking into account the fact that electricity yielded at best less than 20 p.ct. of the total energy of the coal, how could electric power show any economy as compared with the present use of raw coal? It might be said that electricity had not been given a chance; but it had been tried in this country. It had been pointed out by Mr. R. G. Clarry, in a very able speech in the House of Commons a few days previously, that the North-East Coast was supplied now with electricity at a price which would compare with the cheapest supply in any other part; and yet the industries were even more depressed, if possible, there than elsewhere. But it was not necessary to go to the North-East Coast for an example. Those who had gone over the great Ebbw Vale Works would have noticed that they were obtaining electricity from blast-furnace gases for practically nothing; and the same thing applied to the Powell-Duffryn concern, where they were producing from coke-oven gases electricity at quite a nominal figure, after deducting the value of the residuals. Yet, unhappily, these two undertakings were suffering from depression as much as the others. Therefore, he asserted that it had in no way been proved that electricity was going to be the panacea for industrial ills people were endeavouring to make out. Some of the greatest electricians objected very much to the exploitation of their industry by politicians. Pushing electrification could not bring about the abolition of smoke. Of course, in many cases electric power could be substituted for steam; but it must be remembered that steam was used in many industries for other purposes than power—purposes for which it was essential. Again, there were thousands, or even millions, of furnaces in this country used for metallurgical processes; and never would electricity be able to carry out the work done by these. With regard to boilers required for steam generation only, and metallurgical furnaces, gaseous fuel was the sole solution. As for cheap electricity solving the domestic smoke problem, this was even more hopeless. Some years ago the great Dominion of Canada, possessing almost unlimited water power, went into this matter, and they did so in a scientific manner. The whole subject was submitted to the Honorary Advisory Council for Scientific and Industrial Research at Ottawa; and their report, which might be consulted by anybody, pointed out that the entire power of Niagara was insufficient to heat the one city of Toronto. He might quote from the report these few words: "It is therefore hard to conceive of a time when electric energy will compete successfully and on a large scale with coal, oil, gas, &c., for heating." Then it was claimed that it would be an advantage to electrify the railways of this country. It was quite true that in Italy, with large water power resources, it had been practically necessary to electrify railways; but in this country there would be no economy whatever in doing so. Up to the present he did not think that a single responsible railway engineer had looked kindly upon the project, except in special cases and for short distances.

THE TRUTH ABOUT GAS.

As against all this, the gas industry had many advantages to offer. Instead of the less than 20 p.ct. of the heat energy in coal which the electrical people obtained, the gas-works recovered, in a form available for the use of the public, something in the neighbourhood of 80 p.ct. of the heat value contained in the original coal, and, in addition, immensely valuable residual products. They all knew the gas industry was not going to decay; but supposing the country was so misguided as to permit it to do so, all the essential things derived from these residual products would have to be imported by the various industries dependent upon them, who would probably have to "pay through the nose" for what they required. This was a position which could only be contemplated with the utmost disquietude. Mr. Madden had referred to the question of national defence; and in this connection it was remarkable to find that the public, just as they had already forgotten to a great extent the men who went to the front and fought for them, had also forgotten the industry which came forward at a time of national emergency to the support of the country. He did not wish to stress the matter unduly; but they would remember the following words of the late Lord Moulton: "Without the direct aid of the gas industry and the assistance of the knowledge which had been acquired by those who had devoted their lives to it, it would have been perfectly impossible for this country to wage the campaigns of the last three years, or even for any but a trifling time to resist the overwhelming flood of enemies that was poured upon it." In conclusion, he thought that the gas industry neither wanted a subsidy for itself, nor did it want to see a subsidy given to its competitors. The electrical industry was not in such a parlous condition that it could not secure money for its own development; and if the Government would only give both industries a chance, there would be nothing to complain of. The gas industry had no wish to belittle the immense service electricity could render in certain fields; but there were also other fields in which gas was infinitely superior. If the Government would just allow the two to compete with one another, without subsidizing either, it would be to the public good; and both would be able to develop their respective fields for the benefit of the country and its inhabitants.

Mr. W. CLARK JACKSON (Neath) remarked that the paper was very timely, because gas engineers even now were apt to consider their works first, second, and sometimes third; whereas they should at all times remember there were the consumers to be attended to. It was only by persevering in the education of the public that they could hope to develop the industry as it ought to be developed. Sustained publicity was essential; it must not be taken up, put aside for a time, and then taken up again. Unfortunately, many of them had difficulty in persuading boards of directors or members of councils as to the absolute need for the provision of adequate showrooms. He had himself laboured this point with his Council for a number of years. He had a small showroom which had done remarkably good work considering its size; but it was not sufficient for its purpose. Reference had been made by Mr. Canning to the exhibition at Neath. This was a great success, and the cookery lectures evoked much interest. They must strive all the time to get to the public. They knew themselves what could be done with gas, but the general public did not know. The photographs accompanying the paper would be particularly useful to the members.

Mr. A. E. DAVEY (Aberdare) referred to statements which had been made regarding the possibilities of low-temperature carbonization in this connection. He said it seemed to him that the great aim of people fostering these electrical schemes was to connect them with low-temperature carbonization.

Mr. R. J. AUCKLAND (Cardiff) thought the great value of Mr. Madden's paper was in its particularization. They had the "B.C.G.A.," who advertised in a general way, and in a manner which individual undertakings would find it impossible to do, for the good of the whole industry. But each undertaking could derive further benefit by particularization of the wares it had to put before the public. What was needed was to press home particular points in particular directions; and Mr. Madden had shown how this might be done with respect to residual products. Very large success had been achieved by him at Cardiff in this way; and other undertakings would similarly benefit by organizing specialized campaigns in certain directions.

THE SALESMEN'S CIRCLE

Mr. B. J. BELL (Cardiff) said he would like to take the opportunity, as Secretary to the local Salesmen's Circle, of appealing for stronger support. Of late the Circle had not been getting from the district the support to which it was entitled. If the efficiency of the undertakings depended upon the education of their staffs such meetings should have the fullest support. He hoped everything possible would be done to augment the attendances, so that such discussions as took place might be to the benefit of all concerned. It was of the utmost importance that there should be a better balance of attendance from the various undertakings, if the Circle was to be of the greatest possible value.

Mr. J. PROSSER JONES (Caerphilly) pointed out that, in addition to showrooms, publicity could also be advanced by means of literature. The showroom was very nice to look at, but many people would pass it by. What he did, in addition to showroom work, was to put a little advertisement on every gas bill sent out; and this advertisement was altered each quarter. This brought to the notice of consumers apparatus which perhaps they had not heard of before. Showrooms were, of course, essential; but they must be accompanied by propaganda in the form of literature.

The PRESIDENT proposed a hearty vote of thanks to the author, and said it was very important that all connected with gas undertakings in that area should do everything they could to cultivate sales of residuals in their own districts, instead of sending them outside. By so doing, they would assist in maintaining prices at reasonable level, with resultant benefit to the whole of the undertakings in South Wales. If they would take the trouble to send coke round the town in small lots by motor van, as had been done in certain cases, it would probably meet with success. They all realized that there was a very great future for gas; and, notwithstanding all that had been said about the development of electricity in Canada and other places, he had been given to understand that there was a progressive gas undertaking at the very foot of Niagara. If gas could meet competition at a place like Niagara, where power was practically free, it should be an incentive to the industry in this country, where things were different, to "put its back into it." He believed Porthcawl and Port Talbot were now entering into schemes for the provision of electricity. If the gas undertakings still maintained propaganda work, he did not think they would find that the introduction of electricity would affect them very much; but it was essential that the work done by the gas undertaking should be prominently put before the public, not once or twice a year, but practically daily.

HOUSE-TO-HOUSE CANVASSING.

He found in Swansea, at any rate, that the house-to-house canvasser was as good an advertiser as anyone, provided he knew his job. If he could get an interview with the housewife, more orders could be got in this way than in any other. At a recent exhibition in Swansea the Gas Company secured the largest number of votes of any exhibit. They must not forget the fact that it was not considered by some of the leading electrical engineers of the day to be a paying proposition to erect super-stations and distribute electricity therefrom over long distances.

The HON. SECRETARY seconded the vote of thanks, and drew attention to the fact that he had a collection of slides and a lecture on "Gas Manufacture," which anyone could have the loan of on applying to him.

THE AUTHOR'S REPLY.

Mr. MADDEN said it was always a pleasure to him to prepare a paper for the Institution. It was true that the "B.C.G.A." carried on the general propaganda; but each particular undertaking must be responsible for the details. This was the great point he wished to bring out. Literature and house-to-house canvassing were invaluable. In Cardiff they made tremendous use of literature; and much business accrued there from house-to-house canvassing. The output of fires and cookers, due to propaganda and publicity, was nearly three times as much as was the case before. He wished to pay a tribute to Mr. Bell, his District Superintendent, who worked so hard to make the Queen Street window a live one, that it won three prizes in Cardiff Shopping Week. The Company had shown industrial appliances, &c., at the local Engineering Exhibition, and had been astonished at the amount of interest taken in their stand. At agricultural shows, and such like, they had a marquee, and showed sulphate, and crops grown on sulphate. The Sulphate of Ammonia Federation came handsomely to their aid with literature in this connection. They also got the farmer interested in graded coke, and prepared tar for painting out-houses. The matter of low-temperature carbonization was one they must not allow to slip out of their hands. If there was any desire for low-temperature carbonization fuel—and there might be—the proper place to make it was at the gas-works, where they had nine-tenths of the plant that ac-

counted for the capital cost of low-temperature carbonization. Those who had been privileged to hear the able address of Mr. Milne Watson at the annual meeting of the National Gas Council felt that the case for the gas industry was in the best possible hands. ["Hear, hear."] But they must all get in a body behind him, to help him at every time and in every place. The most loyal support throughout was essential.

WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.

Treforest Low-Temperature Carbonization Plant.

At the invitation of Mr. D. Muir, M.I.Mun.E., Engineer and Manager of the Pontypridd Gas Department, the members of the Wales and Monmouthshire Junior Gas Association visited the low-temperature carbonization plant at the Treforest Gas-Works, on Saturday, May 23. Dr. S. R. Illingworth conducted the members over the plant and explained the various processes, following which an adjournment was made to the Municipal Buildings for a meeting, at which the President, Mr. B. J. BELL, took the chair, being supported by Mr. D. Muir, Dr. S. R. Illingworth, and Mr. King-Hiller.

The minutes of the previous meeting were confirmed; and the PRESIDENT extended a welcome to Mr. King-Hiller. He remarked that the Association had again been favoured by the opportunity afforded the members of observing the new plant at the Treforest Gas-Works, which was of much interest, particularly to those engaged on the manufacturing side of the industry.

Dr. S. R. ILLINGWORTH then delivered the following

ADDRESS.

I was invited by Mr. Muir to speak to you on low-temperature carbonization. We are all aware that the carbonization of coal is passing through a transition stage, due to the economic conditions under which we now labour. The carbonization of coal produces three main forms of fuel—viz., solid, liquid, and gaseous. Each type varies within limits. In regard to coke, we can ring the changes from a product of extreme hardness and limited combustibility, down to coke produced at the lower temperatures. The carbonizing works of the future, and the gas-works in particular, must, as Dr. E. W. Smith points out, become more and more a fuel works, supplying solid, liquid, and gaseous fuel of a type to meet local demand. Low-temperature carbonization of coal is one means of treating coal, producing certain products peculiar to itself; and only so long as these peculiarities are of economic value in competition with other methods, has it a place in practical politics. I make these remarks in the hope that you appreciate that there is, or should be, no antagonism between any of the several phases of coal carbonization. Low temperature has failed in the past to win a place in the sun, due to three specific reasons:

(1) The fuel has lacked a robust nature.
(2) The swelling of the coal in the process of carbonization has retarded or inhibited facile discharge from the retorts.
(3) Due in the main to the slow transference of heat throughout the charge at low temperatures, carbonization in bulk has not been a feasible proposition. Narrow-section retorts have been employed, and the consequent small capacity has resulted in high labour costs and concurrent high capitalization on the output.

Defects (1) and (2) are closely related, both as to cause and remedies. In 1909 I had recourse to the blending of caking and non-caking coals in connection with certain work in carbonization at low temperatures. More recently, as the result of purely academic work on certain coking coals commenced in 1918, the cause of the swelling of the coals became evident to me. Blending of coals, and also a process of pre-heating a bituminous coal alone, were worked, to avoid swelling and to produce contraction. Briefly, we can say that a bituminous coal commences to form coke at temperatures from 400° to 550° C. The temperature is a function of the carbon-hydrogen ratio; those coals of higher carbon-hydrogen ratio having the higher initial temperature of coke formation. The initial formation of coke is the more intimately concerned with the decomposition of the γ component—*i.e.*, that portion of a coal ultimately soluble in pyridine, and also in chloroform and benzene. Whether or not this be a primary constituent of coal, we will not discuss on this occasion. The γ compound is of a resin-like nature. It melts, conferring plasticity on the coal mass, at a temperature slightly below that of decomposition. All types of γ compound are decomposed as such at or below 450° C. Thus the initial formation of coke is completed below this temperature, which becomes some 100° higher on a practical scale, in order that the necessary temperature gradient exists within the charge. There exists within the coals a further series of components, referred to as the β type. These are of cellulosic nature. Their chief characteristic for the moment is the fact that they decompose at lower temperatures than the γ. The result is that the coal in the plastic state is distended by the volatile matter evolved from these β compounds, the action of which is analogous to the yeast in dough. Since these β compounds are the main cause of the swelling of the bituminous coals, and, further, since they are decomposed at lower temperatures than the γ compounds, it becomes possible to eliminate them from the coal at a temperature sufficiently low to avoid serious decomposition of the cementing material—*i.e.*, to avoid a coherent mass and serious impairment of the cementing power of the coal. This preliminary treatment of the coal is completed at an economic rate at temperatures in general around 400° C. The waste heat from the carbonization proper is of sufficient intensity and amount to accomplish this end. Consequently the pre-heating operation is analogous in function to an economizer on a boiler.

Coals in general evolve their volatile matter within two characteristic temperature ranges. One of these is below 500° C., the other is in the region of 760° C. I have referred to these as nodal points. The lower nodal point (*i.e.*, the one below 500° C.) varies with the carbon-hydrogen ratio of the coal. The higher nodal point is practically constant in all coals. The lower nodal point is around 275° C. for the lignite type of coals with a volatile about 45 p.ct., and the temperature at which it occurs increases with decrease of the volatile of the coal, until in the case of the anthracites (volatile under 6 p.ct.) it has ceased to exist. Now two facts operate in the swelling of coal: (1) The occurrence of a plastic state; (2) the amount of volatile matter evolved within the plastic layers of the coal when such plastic layers are undergoing decomposition. The persistence of the plastic layer is a question of the amount of γ component. The volatile evolved within this layer is a matter of the substances which undergo decomposition at or below temperatures at which the characteristic γ decomposes. You will appreciate that, if a coal with a very low nodal point (say, around 300° C.) be admixed with a caking coal, the plastic layers of which persist at 400° to 450° C., then the volatile from those substances which contribute to the nodal point at 300° C. will have been evolved from the coal prior to decomposition of the plastic layer, and will hence exert no distending influence on the coal. Moreover, the γ compound will have become diluted with the residue from the less stable coal, and hence the distending influence due to subsequent evolution of its own volatile will be minimized. It so happens that the coals poor in quantity and in quality of cementing material—*i.e.*, the non-caking or weakly-caking coals—are either possessed of a nodal point which occurs at a low temperature, or else, if they be non-caking coals such as the dry steams and anthracites of South Wales, they are possessed of no nodal point at all. We are thus able, from a knowledge of the nature of the gamut of coals, either to blend them or, in the case of bituminous coals, to preheat them so that the final product for carbonization has a specified nature in regard to γ content and the volatile matter evolved at temperatures below 500° C. Briefly, the general salient feature is that the γ content must not fall below 5 p.ct., and should not exceed 10 p.ct. Coal in this condition does not expand on carbonization, but contracts. While thus facilitating discharge from the retorts, it also gives a carbonized product of greater density and hardness.

I have touched on these points. They are not specific to low temperature alone, but appertain to all phases of carbonization. It is of interest to note that the highly-prized gas coals, such as those of South Yorkshire, are possessed of the specific features enumerated above as conditional to the non-swelling of the carbonized product. It is appreciated that other investigators have addressed themselves to these problems.

The third inherent drawback to low temperature has been attacked along a number of lines, which may be enumerated as follows:

(1) The method of the internal heating of the coal while the charge is at rest—*e.g.*, the Maclaurin method, whereby producer gas generated in the lower part of the retort heats the overlying charge by virtue of sensible heat carried upward by the gas. In this case fine coal such as duff cannot be used without briquetting. Moreover, the gas evolved is of a low calorific value.

(2) Internal heating with agitation of the charge—*e.g.*, the Nielsen process, wherein the charge is in a rotary retort through which hot gases are passed. The rotation tends to produce breeze.

(3) Briquetting of the charge—
(*a*) by pressure—*e.g.*, Sutcliffe process;
(*b*) by pressure *plus* heating of the coal—*e.g.*, Fuel Research method, &c.;
(*c*) by pressure and binder—*e.g.*, Fisher.

(4) Briquetting *plus* internal heating, or briquetting and heating the retort externally. The briquetted fuel is carbonized more rapidly than in the mass, due to the large free space for the gases evolved or introduced into the retort.

(5) Use of special forms of cast-iron retort.

(6) Heating in thin layers, as in the lead bath process of Caracristi.

Preliminary operations prior to actual carbonization naturally increase the total cost of production. These costs have to be offset on balance by such factors as greater throughput per capital unit of retort, increased yields of products, enhanced value of products, &c. These factors can only be assessed by actual works operations and tests against market conditions,

guided, of course, by previous experience as to renewals, maintenance, &c., in cognate procedure now in operation.

Briefly, then, from the modern trend of low-temperature carbonization, or in more general terms the carbonization of coal to produce a more mobile range of products to meet requirements for smokeless fuel and a desire for liquid fuel, the operations we have to visualize are:

(*a*) Preliminary treatment—viz., one or more of the processes of blending, preheating, drying, and briquetting.
(*b*) Charging operations in retorting.
(*c*) Retorting.
(*d*) Discharging and cooling of fuel.
(*e*) Condensing and recovery of bye-products.

Mr. Nielsen recently stated that the capitalization per ton for low-temperature retorts must not exceed about 10s.; and in this connection I take it to mean 10s. per ton capacity, with no additional cost for rendering the product marketable. With this view I agree.

We have endeavoured to bear in mind the general points outlined above in designing the plant you have seen this afternoon. We have arrived at this stage by three steps: (*a*) The laboratory stage, mainly concerned with the fundamental characteristics of the gamut of coal, and the influence of such on the behaviour of coals when carbonized. (*b*) The experimental stage, which aimed at testing our theories on a semi-commercial scale, and subsequently arriving at an economic design of plant to make them successful commercially. This we carried out at our experimental station alongside the Maritime Coke Ovens, from whom we drew our gas supply. We received every courtesy from their Manager, Mr. T. Watts, B.Sc. (*c*) The commercial scale. Our first commercial unit, as you have seen this afternoon, is erected at the Gas-Works, Treforest. You will note that we have refitted a bed of the intermittent vertical retorts, initially installed there by Messrs. Robt. Dempster & Sons, Ltd., of Elland. Messrs. Dempsters carried out this scheme for us, and we have received every assistance from their Managing Director, Mr. Broadhead, and Mr. Toogood and his staff. It is not my purpose here to describe all details of the plant. You have seen it in operation; and when we refit the whole installation of these intermittent verticals, the contract for which has been placed, it is our intention to invite the Wales and Monmouthshire District Institution of Gas Engineers and Managers to inspect the plant.

We are using a brickwork retort, and the heat is taken into the charge by H-section conductors made of cast iron. Each conductor is independent and is under no stress. Further, any one conductor is easily removed. Our ovens at Pontypridd are 9 ft. 6 in. long; and since, due to these conductors, we carbonize in five to five-and-a-half hours, our output per oven in the 24 hours is practically 7 tons. It may be of interest to remark that a brickwork oven without conductors, and of the width (14 in.) we use, normally takes some 28 hours to carbonize at corresponding temperatures. In these circumstances the fuel is over-carbonized at the oven walls, and under-carbonized in the centre. The fuel we make is homogeneous throughout, and the volatile is from 5 to 6 p.ct. The retorts are heated either by producer gas or by gas from the process. We have utilized the same charging gear as formerly employed for the bed when working for ordinary gas-works practice, and our labour costs are correspondingly low. Discharge from the retorts is facile, since, by blending or preheating, we guarantee shrinkage of the fuel. You will notice that the coal passes in continuous cycle from the siding, through the retorts, thence as smokeless fuel to wagons.

The yields of products we obtain are of normal nature. All types of coal can be used, provided one is bituminous. The lower the volatile, the greater the fuel yield, but the lower the gas and the oil yields. Broadly speaking, from the Welsh steam type of coals—volatile (say) under 20 p.ct.—we obtain 83 p.ct. of fuel, some 6 to 8 gallons of oil, and about 3500 c.ft. of gas (B.Th.U., unscrubbed, 750). With the higher volatile coals such as are used in the gas industry we obtain about 70 p.ct. of fuel, some 18 gallons of oil, and 5500 c.ft. of gas. One point in connection with the gas yield might be mentioned. The low-temperature gas yield is approximately 40 therms per ton from the higher-volatile coals, as against 80 therms from the high-temperature treatment. We have established that, on the same floor space and within the same cubic capacity as that previously taken for a ten-ton per day throughput of coal at high temperatures, we are obtaining twice the throughput of coal at low temperatures. Consequently the gaseous therm yield is roughly the same per 24 hours; but, of course, twice the weight of coal has to be handled. The therms are too "concentrated," and will need diluting with a weaker gas for distribution. If, however, gas has to be transmitted far—say, under a system of high-pressure distribution—such gas might be more economical, since, per cross-section of pipe, the therms transmitted would be greater. Maybe in future we shall centralize gas production at larger works, and distribute to substations.

In addition to this we can scrub (from the gas) some 2½ gallons of light hydrocarbons, benzoles admixed with naphthenes, suitable for motor purposes. We have not installed a benzole recovery plant at this stage, but we shall do so on the larger basis.

Ammonium sulphate is a problematical asset. True, due to drying the coal, we have an 8 to 10 oz. liquor, but I fear that in the future synthetic ammonia may render the recovery of ammonium sulphate from the liquor unremunerative.

The tendency in the past has been to concentrate attention on one or other of the chief products derived from coal, and regard this as the dividend asset. Nowadays we are regarding all the products from a basis of greater relative importance. Mobility of procedure is the desideratum. The solid form of fuel produced by low-temperature carbonization has a far greater market mobility than ordinary coke in its present form. The product we market is used as a domestic fuel in the open fire and kitchen range, for central heating, in bakers' ovens, for steam raising, and in anthracite stoves. Independent steam trials show that the fuel is equal to South Wales best steam coals. Low-temperature processes thus offer a means of satisfying the solid, liquid, and gaseous demands. The crux of the matter is that the local demand for solid fuel in competition with coal and coke will be such that the straight gas from the carbonization, when diluted with water gas, will furnish not less than the amount of gaseous therms required by the region in which the solid fuel is marketed. This visualizes nothing but a low-temperature process as the source of gas. One sees no reason why the two processes of high and low temperature should not work side by side, each finding its own level. If the demand be for low-temperature products, then this process will become established, if production and capital costs are within economic range. Low temperature enables a wide choice of raw material at a cheap rate in the form of all classes of small coal.

Discussion.

Mr. T. A. CANNING (Newport), in proposing a very hearty vote of thanks to Dr. Illingworth for his address, said he would like to have some further information in regard to the relative economies of preheating and blending coals, the maximum permissible ash content of the coal used, and the nature of the residue left by the fuel when consumed for domestic purposes. In regard to the figures put forward by Dr. Illingworth, the rate of depreciation was certainly liberal. Mr. Canning said that the future of the industry rested not only on gas sales, but also on the profitable disposal of their bye-products.

Mr. V. T. BLAKE (Cardiff) seconded the vote.

The PRESIDENT cordially supported the vote of thanks. The primary duty of a gas undertaking was to provide gaseous fuel in a form suitable for use in its district. Recently some anxiety had been occasioned many undertakings in disposing of solid fuel; but at Cardiff they had met the situation by grading. Dr. Illingworth had said that super gas-works might be created. It had been observed, however, that the distribution of gas beyond 20 miles was likely to prove more costly than the freightage of solid fuel and its carbonization at local gas-works. Assuming that cheap solid fuel was being produced capable of being utilized under all conditions, and at the same time a cheap gas was being made, what would be the effect one upon the other? With regard to the coal carbonized, would the reduction of 10s. per ton in price compensate for the loss of output in gaseous fuel? In his opinion there was a market for smokeless fuel.

Dr. ILLINGWORTH said the question of pre-heating or blending was largely determined by local conditions and the price paid for coal. With regard to the ash content of coal, under existing conditions one had to be satisfied with a maximum of 7 or 8 p.ct. No cinders whatever remained after the use of the solid fuel.

The PRESIDENT, in calling upon Mr. D. Muir to deliver his address, remarked that no one had done more to promote the welfare of the Junior Gas Association than had their host of that day.

METHODS ADOPTED TO DEAL WITH LEAKAGE IN COLLIERY DISTRICTS.

By D. MUIR, of Pontypridd.

The question of unaccounted-for gas is one which constantly demands the attention of gas engineers, but more particularly those situated in mining areas, where subsidence is prevalent. In such areas, broken mains and drawn joints become at times a veritable nightmare. All unaccounted-for gas is not due to leakage, as it consists of losses incurred when connections are being made on the distribution system for the purpose of repairs or extensions, joints and mains leaking, defective meters, public lamps remaining lit after their scheduled time, and difference in temperature between the works and consumers' premises. Where gas is leaking on the distribution system, it is a dead loss to the undertaking, and a source of danger and a nuisance to the general public.

The points enumerated are to be found in any normal undertaking; but in mining areas, where there is a continual movement of the ground, the work entailed in repairing mains and joints is considerable. The Pontypridd area of supply, being situated in a mining area, is no exception; and I will give you briefly the methods adopted to reduce the quantity of unaccounted-for gas in Pontypridd.

In the first place, I had the station meter tested, and found this correct. The holders were then subjected to an examination, and any leakages repaired. This satisfied me that no leakage took place at the works. Then the consumers' meters on the district were tested and overhauled; and the result of

the tests showed the numbers of meters fast and slow were fifty-fifty.

Attention was then directed to public lighting. I found that, as a result of low-grade gas having been supplied due to war conditions, the burners had been rimered out, and were passing double the quantity of gas they originally passed. This, however, was not being charged for, and alone accounted for about 4 million c.ft. annually.

After this matter had been rectified, I turned my attention to the mains and services. In our worst areas I installed Thorpe's diagrammatic meters. These have proved beneficial, as the diagram on the meter shows the hourly rate of flow, and when the flow exceeds the normal it is a good indication of a break in the main.

From observations made when services were bare for inspection, I came to the conclusion that a large number of services were in a very bad condition. I have accordingly re-laid whole streets of services; and it was really a revelation to find the number of services which were absolutely riddled with holes.

In one section of our area, I found a considerable quantity of gas being lost on a 10-in. cast-iron main. I accordingly stripped every joint, and no less than 90 p.ct. required setting-up. These joints had drawn due to subsidence. After a lapse of two years, one particular section again showed signs of drawn joints; and I felt convinced that it would be useless to keep setting-up joints on this particular spot. I therefore decided to fix Dresser split clamps over the spigot and socket joints. These consist of two split clamps, one of which acts as an anchor behind the shoulder of the socket, while the other presses into position a rubber clamp gasket, which is faced with strong duck. These clamps fit the ordinary lead joint; care being taken that the lead joints are well set-up to leave a slight recess into which the gasket can be fixed. These clamps have proved satisfactory; and no further trouble has been given on this particular 10-in. main.

In the Pwllgwaun area of our district, weekly trouble was being experienced on a 6-in. cast-iron main, due to subsidence. Some idea of the subsidence taking place may be gathered from the fact that the Colliery Company are continually repairing the houses in this street. The 6-in. main was continually breaking, and drawn joints were the order of the day. At last the trouble was so acute that a gang of repairers were there every week. After careful consideration, I decided to re-lay this main with solid-drawn steel main with plain ends and Dresser steel pipe couplings. The 6-in. Dresser couplings consist of two pressed-steel flanges, two rubber packing rings or gasket, one steel middle ring, with centre bead for perfect centring, and six bolts and nuts. These couplings combine flexibility and strength, and allow for contraction and expansion, as well as ground-settling. The Dresser steel flange is pressed from solid plate, and is therefore an endless ring, with no weld to break or open-up. The thickness of the metal on a 6-in. Dresser coupling is approximately ¼ in.; and the length of the middle ring is 5 in. The 6-in. main in question has been laid for four months. Up to the present no leakage has been found on it, and I do not anticipate any.

Prior to deciding on Dresser couplings for this particular job, I carried out a test with an 8-in. coupling connecting-up two lengths of 8-in. steel main with blanked ends; the total length being over 70 ft. I then pumped gas into this main up to 50 lbs. pressure, and found same to stand-up absolutely tight. The supports were then knocked out below the coupling, allowing it to drop 2 ft. 3 in. in the centre of the pipeline, and no leakage took place. The pipeline was again brought back to the horizontal, and still remained tight. I also tried the joint up to 150 lbs. pressure, and it remained bottle-tight.

Where movement of the ground is continually taking place, it is customary to find either the joints drawn with subsidence or the mains fractured, due to squeeze set-up. I have found Dresser couplings to act in both cases, owing to the contraction and expansion allowed with them.

In certain parts of our district, the mains are being pushed their whole length towards the other side of the road. This results in services on one side being pulled out of the main, and on the other side being buckled-up. To overcome this, I have made the connections from the main to the service with two brass fittings connecting a stout piece of S-shaped lead pipe. A better method is by the use of pressure Dresser couplings. These consist of a piece of 1¼-in. steel tube drawn down and threaded to 1¼ in. to enter the main. The other end has a flange welded on; the tube protruding for 3 in. past this flange. This tube is again drawn down to allow a 1-in. pipe to pass inside. A flange and rubber gasket with two bolts complete the joint. In use, the pressure coupling is screwed into the main in the usual way, the 1-in. service pipe passed through the flange inside the tube, and then tightened-up. This allows the service to draw-out for a distance of nearly 3 ft. without leakage when the main is being pushed away, and, on the other hand, allows the service to travel in nearly 3 ft. when the main is being pushed towards the service. This method has proved very satisfactory, and has eliminated our trouble in cases of the position of the main shifting.

The methods briefly enumerated here have proved beneficial, and have brought the unaccounted-for gas figure down to the lowest point since 1908. Even in cases where subsidence is not prevalent, I believe trouble is often experienced with drawn joints nowadays, due to the much heavier road traffic setting-up vibration. Dresser couplings would be very suitable in such cases. From my experience with these couplings, I have adopted them in the laying of new mains; and I find that, owing to their great flexibility, it is possible to wipe-out a good number of specials on the work.

I trust that these few notes may be of interest to the members of the Association, as I am sure such difficulties as we experience in Pontypridd are common to a number of undertakings embraced in your field of activities.

Discussion.

Mr. KING-HILLER, on being asked to speak, said that Mr. Muir should be congratulated upon the fact of his being the first gas engineer in Britain to discover the utility of the Dresser joints. His (Mr. King-Hiller's) experience with the joint dated back to 1910, when he went out to Canada to investigate a natural gas proposition which resulted in the formation of a large company and the laying of 170 miles of 15-in. steel main on which Dresser couplings were employed. The main was completed in six months, and careful test disclosed only one slightly leaking joint. The gas issued from the well at a pressure of 850 lbs. per sq. in.—being governed-down to 250 lbs. per sq. in., and, passing along the mains at this pressure, supplied Calgary and towns *en route*. The pressure at the end of the main was 50 lbs., which was governed-down to the town distribution pressure of 5 in. The question of leakage on distribution systems largely resolved itself into one of jointing. Run-lead or lead-wool joints could not remain permanently gas-tight, owing to the effect upon them of temperature changes. He had recently had an opportunity of observing what he presumed was the effect of the heavy traffic on gas mains in some of the chief thoroughfares in London, which were being relaid, and numerous joints were being reset.

Mr. COLLINS (Swansea) asked whether the testing of meters was carried out *in situ*, or were the meters brought to the works? With regard to public lighting, the experience of Pontypridd was, he thought, fairly general throughout the country, as a result of war conditions, and he would like to know if the burners were changed, or simply the nipples. On the point of service inspection, what system was adopted to ensure that every service was right, and was going to remain right? The method adopted in carrying-out repairs on slit collars would be of great advantage to many. He thought the Dresser couplings admirable; but, of course, in normal areas they were not faced with subsidence to the same extent as in colliery districts. In Swansea they had trouble in one area; but this had been overcome by the laying of welded-steel mains.

Mr. J. WOOD (Pentre) said that in clamps of which he had experience the rubber had perished. What would the effect be with the Dresser coupling in the event of this happening?

Mr. WILLIAMS mentioned that at Abertillery subsidence had brought about compression, resulting in the end of the main being forced right through the other joint, and the pipe splitting.

Mr. CANNING (Newport) said they appreciated Mr. Muir's kindness to the Association, and his readiness to assist them at all times. In regard to the Dresser joints, he would like to have some information regarding the life of the rubber packing.

Mr. A. H. SHEPHERD (Swansea), on behalf of the Association, asked Mr. Muir to accept a very hearty vote of thanks for so ably assisting them, not only that afternoon, but at all times since the inception of the Association.

Mr. D. M. JOHN seconded the vote. Leakage, he said, was a most serious problem in colliery districts, and in addition meters gave a deal of trouble. He had experienced difficulty with certain makes of meters of a particular period, but was not aware whether this applied generally.

Mr. MUIR said he appreciated the kind remarks which had been made. Replying to the various points raised, he stated that the testing of meters was carried out *in situ*. The burners of the public lamps were of the old upright pattern; and he had taken the opportunity of discarding these, and having them replaced by inverted burners. With regard to the inspection of services, if, after duly attending to the mains in certain areas, leakage was still taking place, the services were tackled wholesale, as generally they were also found to be too small. In respect of the rubber joint, observation had been made on a joint which had been in use for a considerable number of years, and no deterioration had taken place. He had every confidence that the rubber would stand. In the case of compression on mains, the Dresser joints would be found of advantage.

Following the meeting, the members were entertained at tea.

Gas for Cooking Potato Chips.—It is learned from "Industrial Gas" that in the vicinity of Baltimore a distributor of potato chips has developed a considerable parcel-post business with merchants in the smaller towns, which has been made possible by means of an interesting method of preparation. Cooking potato chips so that they will retain their flavour depends, it has been discovered, almost entirely on the kind of fuel used for the purpose. Gas in connection with surface combustion cookers seems to have solved the problem. In the production of potato chips, one of the most essential points is that the oil in which they are cooked should be kept uniformly at a temperature of approximately 360° Fahr. Too low a temperature of the oil will cause them to absorb an excess of oil before being properly cooked. Too high an oil temperature results in the majority of the chips becoming too dark before the rest have attained the desired colour. Gas was finally adopted owing to the uniformly ideal conditions assured by its use as a fuel.

NATIONAL ILLUMINATION COMMITTEE OF GREAT BRITAIN.

Report for the Year 1924

From Mr. H. Buckley, Hon. Secretary, we recently received the following report for 1924 of Lieut.-Col. Kenelm Edgcumbe, the Chairman of the National Illumination Committee of Great Britain, which was presented at a meeting of the Committee on Jan. 29 last.

The work of the Committee during the past year has been principally concerned with business arising from the Sixth Session of the International Commission on Illumination, which was held at Geneva in July, 1924. In this connection the Sub-Committees on motor-car headlights and on symbols and nomenclature prepared reports for presentation at the meeting. As regards the former, the view put forward by the British delegates, that it would be premature to propose standardization at the moment, was adopted. The symbols proposed by the British Committee were adopted, and several recommendations of the Committee dealing with definitions were approved. The British Committee was represented by the Chairman (Lieut.-Col. K. Edgcumbe), Dr. Kerr, and Messrs. H. Buckley, W. T. Dunn, L. Gaster, C. C. Paterson, J. M. G. Frezise, J. W. T. Walsh, and R. Watson. Unfortunately Mr. Butterfield, Mr. J. G. Clark, and Mr. P. Good were prevented from attending. Representatives of France, Italy, Switzerland, the United States, and observers from Japan and Poland attended the meeting.

Reports of the meeting prepared by various members of the delegation have appeared in the technical periodicals [see "JOURNAL," Vol. 167, pp. 446, 642, 697; Vol. 169, pp. 150, 219, 349, 538, 606; *ante*, p. 467]. The following decisions were arrived at as a result of the meeting:

(1) The International Commission recommended for international adoption as the primary standard of light the brightness of a black body operated under conditions subject to accurate specification, and further recommended that the National Laboratories be asked to take steps:

(a) To formulate standard specifications for the construction and operation of the black body as a primary standard of light;

(b) To fix upon a definite figure for the brightness as a function of the temperature of such body, expressed in international candles per square centimetre.

(2) A Sub-Committee was appointed to draw-up a vocabulary dealing with illumination.

(3) The Commission provisionally recommended certain values for the visibility factor.

(4) The Sub-Committee on heterochromatic photometry was asked to include in its work the study of the properties of absorbent screens.

(5) A Sub-Committee was appointed for the study of colorimetry.

DEFINITIONS.

(6) The following definitions were adopted:

(a) *The Transmission Factor* of a body is the ratio of the flux transmitted by the body to the flux incident upon it.

(b) *The Absorption Factor* of a body is the ratio of the flux absorbed by the body to the flux incident upon it.

(c) *The Reflection Factor* of a body is the ratio of the flux reflected by the body to the flux incident upon it.

The flux reflected according to the laws of specular reflection is called specularly reflected flux, and the corresponding reflection factor is called the factor of specular reflection. The flux diffused—*i.e.*, that sent out in directions other than that of specular reflection—gives the diffuse reflection factor. The total reflection factor is obtained by considering the whole of the flux reflected by the body.

(d) *The Total Flux* of a source is the flux emitted by that source in all directions.

(e) *The Upper Hemispherical Flux* of a source is the flux emitted by that source above the horizontal plane passing through its centre.

(f) *The Lower Hemispherical Flux* of a source is the flux emitted by that source below the horizontal plane passing through its centre.

(g) *The Mean Spherical Intensity* of a source is the average value of the intensity of that source in all directions in space.

(h) *The Mean Upper Hemispherical Intensity* of a source is the average value of the intensity of that source in all directions above the horizontal plane passing through its centre.

(i) *The Mean Lower Hemispherical Intensity* of a source is the average value of the intensity of that source in all directions below the horizontal plane passing through its centre.

(j) *The Mean Horizontal Intensity* of a source is the average value of the intensity of that source in all directions in the horizontal plane passing through its centre.

(k) *The Reduction Factor of the Mean Spherical Intensity* of a source is the ratio of the mean spherical intensity to the mean horizontal intensity.

(l) *The Efficiency of a Source* is the ratio of the total luminous flux emitted to the total power consumed. In the case of an electric lamp it is expressed in lumens per watt. In the case of a source depending upon combustion it may be expressed in lumens per thermal unit per unit of time.

(m) *The Visibility Factor* for monochromatic radiation is the ratio of the luminous flux to the corresponding energy flux.

The relative visibility factor of a monochromatic radiation is the ratio of the visibility factor of that radiation to the maximum value of the visibility factor.

(n) *Brightness*. The brightness in a given direction of a surface emitting light is the quotient of the luminous intensity measured in that direction by the area of this surface projected on a plane perpendicular to the direction considered. The unit of brightness is the candle per unit area of surface.

NOTE.—The above definitions are translated from the official French text. The official English translation will be published later.

SYMBOLS.

(7) The following symbols were adopted:

Luminous flux . . .	F	Transmission ratios .	τ
Candle-power . . .	I	Absorption „ . .	α
Illumination	E	Reflection „ . .	ρ
Brightness	B	Visibility factor . . .	K

(8) It was decided that at the next session a meeting should be devoted to papers and discussion on the art of illumination and the furtherance of good lighting.

(9) It was decided that questions relating to street lighting should be considered at the next session, and the National Committees were asked to study the subject and to transmit their communications to the Central Office at the earliest date possible.

(10) The report submitted by the Chairman of the Advisory Committee on the lighting of factories and school buildings was recommended as a basis for regulations or recommendations on the lighting of factories and school buildings.

(11) The National Committees were asked to study the question of glare from motor-car headlights, and to send their communications to the Central Office in ample time for the next session.

The following Committees have now been appointed by the International Commission; the representatives of Great Britain thereon being shown in brackets:

Heterochromatic Photometry and Colour Screens—(Dr. E. H. RAYNER).
Definitions and Symbols—(Mr. J. W. T. WALSH).
Lighting of Factories and Schools—(Mr. L. GASTER).
Motor-Car Headlights—(Lieut.-Col. K. EDGCUMBE).
Colorimetry—(Mr. T. SMITH).

It was decided to reduce the annual contribution payable by each country in view of the probable increase in the number of constituent countries. Great Britain will now pay about £77 per annum instead of £113 10s.

The establishment of a Sectional Committee on Illumination by the British Engineering Standards Association, mentioned in last year's Report, has now been carried out. The British National Committee forms the nucleus of this Committee which also includes twelve representatives of Government Departments, Manufacturers' Associations, and Technical Institutions. Five Sub-Committees dealing respectively with photometers, nomenclature and symbols, illumination glassware, fittings, and street lighting have been set up and have held a number of meetings.

Mr. Walter Waugh, Chigwell Hall, Essex, and of Coronation House, Lloyd's Avenue, E.C., chemical merchant, of Messrs. Blagden, Waugh, & Co., and Messrs. Walter Waugh & Co., left estate of the gross value of £322,010, with net personalty £257,670.

BUXTON CLAY CONVENTION.

Ceramic Society's Meeting.

In connection with the Clay Convention, organized to meet at Buxton, the spring meeting of the Refractory Materials Section of the Ceramic Society was held at the Palace Hotel, on May 19. There was a large attendance, and the proceedings were opened with Mr. J. HOLLAND in the chair.

A recommendation from the Council was adopted, by which North Yorkshire, Durham, and Northumberland were constituted a new district; and three members were elected on the Council to represent the district. It was announced that the autumn meeting would be held at Wembley, as last year. Mr. FRANK WEST, of the Derbyshire Silica Firebrick Company, Ltd., was elected President of the Ceramic Society, and occupied the chair for the remaining portion of the session.

The first item on the lengthy programme of papers was one on "Manufacture of Magnesite," by G. H. REED. In the absence of the author, this was taken as read, and will duly appear with the others in the "Transactions" of the Ceramic Society.

HEAT INSULATION.

Next came a valuable contribution by A. T. GREEN, on "The Heat Insulation of Kilns and other High-Temperature Installations." After a discussion on the losses of heat through kiln walls by conduction, radiation, and convection, the author proceeded to consider the possibilities of avoiding some of this loss by means of insulation—more especially in high-temperature work. The insulating materials available for use in high-temperature work consist mainly of slag wool and diatomaceous earth products. Slag wool has only a very limited application for such work, so that diatomaceous earth products furnish the bulk of high-temperature insulators. Diatomaceous earth, diatomite, kieselguhr, or infusorial earth, as it is variously called, consists essentially of silica; but the natural deposits contain variable proportions of impurities, such as lime, iron oxide, clay, &c., the presence of which is liable seriously to reduce the insulating efficiency of the material in practice.

The essential properties of insulating materials for high-temperature work are low thermal conductivity and high porosity. As a satisfactory guide for successful working, the coefficient of thermal conductivity should range between 0·00025 and 0·00050 at 400° C. The high insulating properties of such materials are in large measure due to the nature and quantity of the pore spaces, the size and disposition of which influence the heat conductivity. It is worthy of note that slag wool with a porosity of 88 p.ct. is not so good an insulator above 450° as diatomaceous earth brick with a porosity of 75 p.ct.; the pores in the latter material being much more minute and disconnected and evenly distributed. Most good insulators have an apparent porosity of between 70 and 80 p.ct.

Pure diatomaceous earth is highly refractory, and retains its porosity at about 1250° C. The presence of lime, iron oxide, clay, &c., in the finely-divided material leads to easy vitrification, with consequent high shrinkage and great decrease in the insulating properties. Slag wool is not reliable for insulating purposes above 700° C. For high working temperatures, a diatomite material containing at least 93 p.ct. of silica and less than 2 p.ct. of lime is necessary.

Insulating methods are extensively used in the iron and steel industry, resulting in fuel economy. In the gas industry the value of insulation is receiving keen appreciation; the results being fuel economy, with increased comfort of the workers in vertical retort plants. The effect of insulation of the tops of the settings by a layer of insulating bricks has resulted in a surprisingly great improvement in working conditions. In some works the fronts of the settings are similarly covered by a layer of insulating bricks. Incidentally, this insulation must give more uniform temperatures round the retorts, as well as some conservation of heat. Many gas engineers are now placing the insulating materials in the walls (instead of on the outer surface), with a view to greater heat conservation and even temperature distribution. In the "GAS JOURNAL" for Nov. 28, 1923, J. S. Thorman, in a paper read to the Southern Association of Gas Engineers and Managers, showed conclusively how insulation makes a waste-heat boiler system very efficient.

In his concluding remarks, the author stated that the selection of insulating material for high-temperature work cannot be based on insulating efficiency alone. It is absolutely essential beforehand to have a complete knowledge of the circumstances of its future use, particularly regarding the face temperature to which it will be subjected. The following data will then serve well in the selection: (*a*) The coefficient of thermal conductivity of temperatures between 300° and 800° C., or the insulating efficiency based on a test simulating industrial conditions; (*b*) percentage porosity, with some description of the nature of the pore-spaces; (*c*) refractoriness (*i.e.*, specification test), with the temperature at which the material disintegrates or otherwise loses its structure; (*d*) crushing strength as an indication of the mechanical strength.

"A Note on the Structure of a Fused Fireclay Crucible," by W. J. REES, B.Sc., F.I.C., was taken as read, and will be published in due course. Mr. REES read a paper by W. HUGILL, B.Met., and himself, on "The Effect of Repeated Burning on the Structure and Properties of Lime-Bonded Silica Bricks." In all, eleven reburnings were made. The results indicate the importance of the "soaking" period of the burn, especially of the first burn. There is very little change in volume after the first burn. Porosity falls steadily down to the seventh burn, with little subsequent change. Crushing strength increases notably to the seventh burn, and after the sixth burn a gradual increase in toughness is very noticeable. Lengthening of the "soaking" period of the burn will decidedly increase the mechanical strength of the bricks.

REFRACTORINESS AND AFTER-CONTRACTION.

Next followed a valuable paper by T. F. E. RHEAD, M.Sc.(Manc.), A.I.C., and R. E. JEFFERSON, M.Sc.(Manc.), A.I.C., of the Birmingham Gas Department, entitled "Notes on: (1) Testing for Refractoriness and After-Contraction; (2) A Few Experiences with Refractories in Vertical Retorts."

In the first part reference is made to difficulties arising in connection with the Institution of Gas Engineers' Specification. The test for refractoriness, first adopted in 1912, and modified in 1922, still leaves the possibility of different results being obtained for the same material, owing to the material being heated (1) to the specified Seger cone or (2) to the actual squatting temperature. A further modification is now proposed as follows: "A definite size of cone ground to the same shape as a Seger cone, with one edge perpendicular to the plane of the base, is heated with the base horizontal to the specified Seger cone, taken from the furnace, and examined with a straight edge, to see whether it shows signs of bending—this bending or matrix running out constituting the definitions of signs of fusion. The rates of heating and oxidizing are as before." It is proposed to call this "The Gas Engineers' Refractoriness Safety Test," to save confusion with the better-known squatting test.

From a routine testing point of view for commercial use, the above safety test offers several advantages: (1) It shows the softening of the material at a somewhat lower temperature than the squatting test. (2) With the squatting test it is very difficult to judge from the appearance in the furnace whether the material is being overheated, and a second test is often necessary. (3) By stopping the heating of the test-piece at the minimum specified zone, the wear and tear on the furnace is minimized. (4) It is much easier to stop a test at a given temperature when using a series of Seger cones than to stop when the test-piece itself shows signs of bending, rounding, or tip touching base. This is because of the additional information given by the behaviour of other Seger cones of the series. (5) The correct rate of heating during the last 100° to 120° C. is a matter of considerable difficulty—especially with a gas-heated furnace. This difficulty is increased the higher the temperature to be attained, owing to the diminishing head of heat between the flame temperature and the test-piece.

The chief signs of fusion which can be detected by the naked eye are: (1) Glazing of surface; (2) bending of test-piece; (3) swelling; (4) loss of angularity of edges; (5) matrix running out; (6) flowing. Many tests by different laboratories seem to show that with fireclay, silicious, and silica refractories a suitably shaped test-piece, heated under specified conditions, begins to bend, or the matrix runs out, either before or as soon as the other signs of fusion appear—with the exception of surface glazing. Mere surface glazing could not be held to represent failure. The amount of bending is the depth of the chord formed by placing a straight edge against the bent edge of the cone.

The refractoriness safety test has two important functions: (1) It determines whether a material has any claim to be classed as a refractory when tested under certain standardized conditions. (2) Being a moderately quick test, it gives the purchaser a fairly reliable check as to the constancy of quality of refractories coming from any particular maker. Too much must not be expected from the test.

The after-contraction test is probably the most important test in the present specification. It throws light on the correctness or otherwise of the heat treatment already given to the refractory by the manufacturer. Unfortunately, the correct interpretation of this test has been shown to be full of pitfalls; the result being affected by furnace design, as well as unequal heating, &c. From results obtained by the authors, it seems questionable whether determining the after-contraction at the one temperature of 1410° C., as per specification, is sufficient with certain refractories—*i.e.*, the composite fireclay-silica brick.

REFRACTORIES IN VERTICAL RETORTS.

Part II. of the paper gives some particulars relating to (1) measurements of the expansion of a vertical setting while being brought into commission; and (2) observations made during the dismantling of a vertical retort setting. The results and observations are discussed in some detail.

A second paper by W. HUGILL and W. J. REES was entitled "The Influence of Iron Oxide and Iron Sulphides on the Rate of Quartz Conversion in Commercial Silica Brick Manufacture." This was taken as read. The results of the investigation showed that the presence of iron oxide or iron sulphide had a favourable effect in increasing the rate of quartz conversion with the same heat treatment, and also in increasing the mechanical strength of the bricks.

Papers by Messrs. L. S. THEOBALD, B.Sc., A.R.C.S., and

A. T. GREEN were also taken as read. They were entitled "Observations on the Elimination of Carbonaceous Matter from Fireclay Bricks" and "An Investigation of the Changes taking place during the Industrial Burning of Fireclay Bricks." They had special reference to bricks made of Stourbridge clay, a Yorkshire fireclay, and a Scottish fireclay, and contained much useful data, &c.

The last paper to be read was by J. & W. B. MITCHELL, entitled "Laboratory Furnace for High Temperatures." This gave an account of a new type of electric furnace in which a metallic resistor is used in the form of a molybdenum wire wound round a small tube; a special contrivance being employed for protecting the metal from the baneful effects of high temperatures. This type of furnace is available for refractory testing, and also for other laboratory purposes, such as metal melting and the standardization of pyrometers at the high-temperature points.

A cinematograph film of the Derbyshire Silica Works was prepared to illustrate the process of the manufacture of carbonizing plants for gas-works.

YORKSHIRE JUNIOR GAS ASSOCIATION.

Visit to the Wakefield Gas-Works.

The Association visited the works of the Wakefield Gas Light Company on Saturday, the 6th inst., with the object of seeing the work of erecting a new bench of horizontal retorts, consisting of six settings of ten retorts arranged in five tiers. The new bench will replace seven settings of eight inclined retorts.

The retort house was built 25 years ago, and contained a bench of inclined retorts consisting of nine settings. Three settings were added in 1908. The horizontal thrust on the discharging side of the inclined settings has distorted the retort house wall; the maximum distortion being 6½ in. As the movement of the wall in the year 1923-4 amounted to 1 in., it was decided where possible to build massive buttresses against the walls. These buttresses are 26 ft. high, 14 ft. at the base, and 23 in. thick, built into the pilasters of the building, which are 20 ft. apart.

It was further decided to remove the inclined retorts, which were worn out, and replace them with horizontals—this work to be done in two stages in separate years, as the Company possess no other carbonizing plant. The horizontal plant is so designed that no thrust from expansion will be carried to the retort house walls; the charging and discharging floors being entirely free from the retort bench.

In order to proceed with the work of demolishing the old settings of inclines, it was necessary to build a new chimney with which to work the remaining five settings, as the flue to the old chimney left the inclined settings at right angles under those to be removed. This chimney was built during last autumn and winter, being completed just in time for its appointed task.

Work was commenced on Feb. 1 by Messrs. Drakes, Ltd., to whom the carbonizing plant and stoking machinery, together with the generating plant, were entrusted. The first section of three settings should be ready for gas making on Sept. 1, and the remaining three settings on Oct. 1. The completed scheme will consist of two benches of six settings of tens. The existing coal plant will be used for a few more years. The coke will be dealt with by a retort-house conveyor to each bench—each feeding to the centre of the house into a yard conveyor arranged at right angles, which will convey the coke either into an existing ferro-concrete hopper or on to the yard as desired. The conveyors are of the "De Brouwer" type, being made by Messrs. W. J. Jenkins & Co., Ltd., of Retford. A 20-KW. generating plant in duplicate is being installed to provide the current for the stoking machinery. The coal conveyors and the coke conveyors will be operated by steam.

The two benches of retorts will have a capacity of 2½ million c.ft. of 500 B.Th.U. gas per day; the output of the superseded plant being barely 2 million c.ft. daily. It may be interesting to mention the fact that the gas sold for the year ended Dec. 31 last showed an increase of 7·37 p.ct. over that sold in the preceding year.

The visitors saw a blue water gas plant under process of reconstruction, and at the same time a duplicate plant in operation. New exhausters made by Messrs. G. Waller & Son, Ltd., and a rotary scrubber by Messrs. W. C. Holmes & Co., Ltd., were also inspected.

Tin Decorating by Gas.—It is stated by the "Intercolonial Gas Journal of Canada" that a large tin decorating works in New York some little while back scrapped an antiquated heating system, and substituted for it modern gas-fired ovens. During the first year this resulted in a fuel saving of $160 a month for four ovens. In addition, two men were shifted to other work, which represented a saving of $55 weekly. At the same time production was increased 17 p.ct. In this way, the new equipment actually paid for itself during the first twelve months of use.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Ventilate the Bath-Room.

SIR,—I have read with interest the paragraph entitled "Ventilate the Bath-Room" in the issue of the "JOURNAL" for May 27 (p. 583).

The suggestions made by your correspondent were, I think you will agree, fully covered in the Report and Specification submitted by the Gas Appliances Specification Sub-Committee to the National Gas Council in May, 1924—see paragraphs 5, 7, and 8 on p. 5 of the Report; also a paragraph on p. 10 of the Specification, headed "Instruction Plate for use with Geysers with Automatic Dual Valves."

INTERESTED.

June 3, 1925.

THE PARAGRAPHS REFERRED TO.

(5) In the opinion of the Sub-Committee the existing type of instruction plate, constructed of a brass plate with stamped lettering, is not sufficiently legible, and it is recommended that an instruction plate (preferably of enamelled iron, with white letters on a salmon-red background) should be affixed to the geyser immediately over the spout, lettered in accordance with the Specification.

(7) *Ventilation.*—It is essential that the room in which the geyser is fitted should be adequately ventilated in such a manner that the ventilation may not be interfered with, but remain permanent. The vent pipe must be rigidly fixed, and not less in diameter than the flue spigot at the top of the geyser, and carried into the nearest chimney flue or through the external wall. In the latter case a suitable terminal or outside wind-guard must also be fixed. When a chimney is not available, or is defective, and the geyser is fixed immediately under a well-ventilated roof space, the flue pipe may be carried through the ceiling and fitted in the manner described in the Book of Instructions for fixing geysers issued by the National Gas Council. No geyser should be fixed without a baffle in the vent pipe, as near to the ceiling as possible.

(8) Two Instruction Cards should be supplied with each geyser—one for the fitter and the other for the user—containing full instructions for the fixing and use of the geyser.

Instruction Plate (for Use with Geysers with Automatic Dual Valves).

This plate to be affixed immediately over the spout and to be enamelled with plain lettering (preferably with white letters on salmon-red background) as follows:

1. WELL VENTILATE THE ROOM.
2. Swing out the burner.
3. Turn on gas tap and light burner jets.
4. Swing in the burner slowly.
5. Turn on water tap slowly.
6. TURN OFF GAS BEFORE ENTERING BATH, and again MAKE SURE that room is WELL VENTILATED.

Heating Bath Water by Electricity.

SIR,—Having received an illuminating publication from you without any cost to myself, I suppose it is only right for me to give you a therm's worth of energy in return. It is rather surprising that some of my recent doings in Leeds should be so extensively known to you, but that my pioneer efforts on your behalf should be unrecognized.

Some ten years ago I had a brain-wave that coal-fired boiler plants at public baths—even granting a thermal efficiency on test of 75 p.ct.—were hopelessly uneconomical and wasteful, by reason of the intermittent character of our business. Owing to the good offices of the Chairman of a Gas Company, I was able to go pretty thoroughly into the matter of water-heating by gas with Mr. F. W. Dye, who was considered to be a most able man, and who had sufficient vision to see that in the heating of water for public baths there was unlimited scope for the gas engineer.

Unfortunately, the particular period was an awkward one for any sort of capital expenditure, and so the germ could not develop. Our idea was a battery of gas boilers sufficient in number for our busy periods, with an arrangement that only one could be utilized for our least busy periods, and that one be thermostatically controlled to give a minimum fuel consumption. Immediately I was able to put the idea into operation, the system was installed. Two very small establishments were dealt with in this way; the amount of water being heated per annum approximating two million gallons. This was only a small beginning; and I would suggest that it did not require a "real live" engineer, but, on the contrary, anyone who was not dead any higher than his boots, to see the wonderful vista of a huge business for the gas people.

Let us see what happened. The Out-Door Manager of the local Gas Company was extremely interested in the experiment, and in working-out fuel costs allowed for the usual trades discount of 35 p.ct. After the plants had been installed, I was surprised to find that the Board of the Company refused to allow me more than the general discount of 2½ p.ct., because public baths were not down on their list of "special trades"; and yet a trouser presser using a single gas-iron came under this special rate. In spite of repeated protests and pleadings, the Company turned a deaf ear.

The "real live" sparks from the wires of Poplar having come into contact with something that was in pretty bad "odour," had to get busy and do what was considered, and by your remarks is still considered, impossible. Poplar, you say, was wrong. The immediate effect was a special reduction of 10 p.ct. in the price of gas. An electric boiler was installed, and then the Gas Company gave way, and allowed the full 35 p.ct. discount. That is the finish of this story, and the "might have beens" have ended.

Regarding my paper, it is not so very surprising to me, after my previous experience, to find that the gas industry is still without "real live" people; for if they had not been "dead from the boots up," they would surely have quoted the free advertisement therein given:

> "When my Committee . . . I installed a series of small gas boilers. The success of this system may be judged by the fact that the cost per bath for gas worked out at 2·23d., at the cost of 3s. 9¾d. per 1000 c.ft., against a coal cost of 5·4d. per bath."

I had not intended to be cynical; but on opening your "JOURNAL," and reading your "Memoranda," I came across the word electricity so often that I wondered if you were out to "boost" your business opponents.

I would just like to say that I am not subsidized by either gas or electricity undertakings, and the personal antipathy of editors towards each other does not interest me at all. I heat about 50 million gallons of water per annum; and the fact remains that the gas people just threw this business away—and who knows how much more?

L. JEFFERSON-HOPE,
Chief Superintendent.

Baths and Wash-Houses Department,
Metropolitan Borough of Poplar,
Roman Road, London, E. 3,
June 2, 1925.

[Reference is made to this subject in the "Electricity Supply Memoranda" to-day.—ED. "G.J."]

REGISTER OF PATENTS.

Apparatus for Lighting Gas.—No. 232,645.

TODMAN, J. C., of Acton, W. 3, and METCALFE, F. E., of Waltham Abbey.

No. 27,600; Aug. 1, 1924.

This invention relates to apparatus for lighting gas by the interposition of a glowing filament in the path of the gas as it emerges from the burner.

The patentees claim: A combined gas and electrical switch for use in gas lighting apparatus comprising the combination with a gas cock of a stationary insulated electrical contact ring and a contact piece moved outwardly into sliding contact with the inner surface of the ring by the initial movement of the parts when the operator exerts a pressure to turn on the gas.

Grids for Purifiers.—No. 232,791.

SPENCER, J. A., of Southall.

No. 12,068; May 16, 1924.

This invention relates to the construction, arrangement, and combination of elements forming grids, for gas purifiers, of the type in which two rows of bars are separated by bearer bars so that the rows break joint; and the object of the invention is an improved construction whereby a series of pockets is formed between the two rows of bars in each grid, which assist in supporting the purifying material in superimposed layers, prevent each layer from unduly settling and varying in density, or the upper layer from falling or settling upon and compressing or increasing the density of the layer below. Only one upper grid is necessary in purifiers 4 ft. deep above the bottom grids, or two upper grids for purifiers 5 ft. or 6 ft. deep.

The grid embodies two rows of bars for supporting the purifying material. The bars are arranged a pre-determined distance apart in each row upon tie rods or cross-pieces of timber which pass through mortised holes therein, and are prevented from shifting their positions by dowel pins or nails. A layer of these support-bars with their cross-pieces is arranged upon each side of bearer bars or distance pieces running at right angles, and the bars in each row are so arranged relatively that they break joint with the bars in the other row.

The design of the grid is fully described and illustrated in the specification.

Purification of Gas.—No. 233,011.

COBB, J. W., and HODSMAN, H. J., both of Leeds.

No. 308; Jan. 4, 1924.

This invention is for an improved process of purifying fuel gases relying upon the use of contact materials, such as iron oxide or iron oxide containing materials, in a heated state for effecting the partial oxidation of hydrogen sulphide by the free oxygen of the gas. According to the claims, the process comprises subjecting the gases to the action of contact materials, such as iron oxide, adapted to secure the partial oxidation of the hydrogen sulphide under conditions of temperature and humidity which will ensure that the free sulphur formed shall be carried forward from the contact bed and that the latter maintains its activity, and utilizing ammonia to enable the removal of sulphur dioxide present after partial oxidation of the hydrogen sulphide to be effected by condensation and washing operations.

The ammonia content of the gas is adjusted to ensure that, under the conditions in which the treatment with hot iron oxide and the further treatment of the gas is carried out, the acidic oxygen containing sulphur compounds may be effectively removed.

After subjecting the gases which have passed through hot iron oxide to condensing and washing processes, they may be passed through a cold oxide purifier to remove any residual hydrogen sulphide.

The patentees give the following example of working. A coal gas prepared for town supply, the composition (by volume) of which when purified would be substantially as follows, was treated:

CO_2	3·0 p.ct.
C_nH_m	2·5 ,,
O_2	1·0 ,,
CO	13·0 ,,
CH_4	24·5 ,,
H_2	37·0 ,,
N_2	19·0 ,,

The gas entering the purification apparatus, in which the iron oxide was maintained at a temperature of 300° C., contained per 100 c.ft. 140 grains of ammonia, 570 grains of H_2S, and 1·9 p.ct. by volume of oxygen. On leaving the apparatus, 50 grains of ammonia, 80 grains of free sulphur as H_2S, and none as sulphur dioxide, and 0·5 p.ct. of oxygen were present in each 100 c.ft. of the gas after washing.

MISCELLANEOUS NEWS.

GAS SUPPLY OF PLYMOUTH.

In Plymouth there are two separate gas undertakings—one at Devonport, the property of the Corporation, and the other at Plymouth, belonging to a Company. Plymouth became possessed of its own gas undertaking when, ten years ago, it spread its tentacles westward and took the naval and dockyard town of Devonport within its grasp. When the Gas Committee presented a favourable report of the undertaking to the Town Council last week, several members urged that its prosperity was an argument in favour of municipalization, and suggested that the acquiring of the Plymouth Gas-Works should be considered.

The Chairman of the Gas Committee (Major J. Clifford Tozer) stated that during the past year the undertaking had made a net profit of £10,524, which would be transferred to the reserve fund. They had had a record output of 792 million c.ft., and had reduced the price of gas by 2d. per 1000 c.ft. His Committee recommended that the salary of the Gas Engineer (Mr. W. P. Tervet) should be increased from £725 to £800 per annum, and thereafter by annual increments of £25 to £850. In arriving at this decision, the Committee had been guided to a large extent by the satisfactory position in which they found the undertaking. The success was in a large measure due to the activities of the Gas Engineer, who had held the position for seventeen years, during which time the output had been trebled.

Mr. E. W. Perry congratulated the Chairman of the Gas Committee on the "magnificent report," and suggested, after such a fine record, they should now acquire the Plymouth Gas-Works, so that the Plymouth ratepayers could join in the pæon of praise. Alderman J. J. H. Moses said things commonly necessary should be commonly owned. Those things essential to the lives of the people should be controlled by the people, and not be in the hands of certain individuals so that they might "squeeze profits." The result of their gas undertaking justified what the Labour Party had been advocating. Mr. G. P. Dymond said the reason why the Devonport undertaking was so prosperous was because it had by its side the evidence of what could be done by private enterprise, so far as the Plymouth Gas Company were concerned. It was not a question of ownership, but efficiency in management. It did not matter whether it was publicly or privately owned.

The minutes were approved.

BURNLEY GAS DEPARTMENT.

In his annual report, Mr. J. H. Clegg, the Gas Engineer to the Burnley Corporation, states that there was a net profit of £38 after payment of capital charges. The price of gas had been 8½d. per therm, and the year's result was far better than was anticipated. The gas sent out showed an increase of 1·85 p.ct., and the gas unaccounted for was 4·52 p.ct. of the make. The sales by prepayment meter were increasing annually, being now 46 p.ct. of the total. After dealing with the slump in residuals, Mr. Clegg states that the department are giving more attention to domestic consumers of coke, and by this hope to lessen the difficulties. If, he says, every gas consumer used a hundredweight of coke per month, there would be no necessity to export a single ton. The production of ammonia was not high enough in his estimation, and he attributed the loss to the inefficiency of the present scrubbing plant, and its small capacity. The sulphate plant was very old, and not now efficient, besides being unable to cope with all the production of ammoniacal liquor last year. A Pelouze and Audouin extractor was now being fixed to improve the results, or, at any rate, to prevent further decline. The average value of the gas supplied was 479 B.Th.U. The waste-heat boiler had relieved the strain on the Lancashire boilers, which had been overworked for some years. By its use, 1600 tons of coke had been saved. The pan ash washer had already recovered 340 tons of coke, and saved £65 in cartage to tip. The full value of these recent installations would not be realized until the coke market was more normal. The new 3 million c.ft. gasholder had been put into use; and when the new governor house was completed this month, gas could be served direct from that station. The whole of the street lamps, with the exception of 28 high and low pressure lamps, had been fitted with controllers, and greater regularity of lighting had been obtained, and a reduction had been made in the number of mantles used. During the past year, sixteen beds in the inclined retort house were reset, and during the present year a further ten settings would be renewed. This would recondition half their plant for a further period of approximately five years. The remaining carbonizing plant and C.W.G. plant was now ready for scrapping, and was very unreliable. These remarks applied also to a portion of the subsidiary plant; and unless the first unit of the new plant at Old Hall was ready for gas-production in the winter of 1926-27, it would be necessary to expend a substantial sum of money on the present works to ensure a proper supply of gas adequate in quantity and quality.

BOLTON CORPORATION GAS ACCOUNTS.

Reporting to the Town Council upon the results for the year ended March 31, the Bolton Gas Committee state that the quantity of gas made was 1,217,213,000 c.ft., compared with 1,178,961,000 c.ft. in the previous year. Mr. Thomas Glaister, Chairman of the Committee, puts on record his appreciation of the support given to him by the Committee, and congratulates the Engineer (Mr. W. J. Smith, B.Sc.) and his staff on their whole-hearted co-operation.

The accounts, prepared by Mr. W. J. Jeffries (the Borough Treasurer) show a gross profit of £66,750. The sum of £14,000 has been placed to the depreciation and renewals fund, the revenue contributions to capital amount to £4008, and a balance of £24,387 remains to be carried forward.

ROCHDALE GAS MANAGER'S RESIGNATION.

Mr. T. Banbury Ball Disagrees with the Policy of the Gas and Electricity Committee.

Reference is made elsewhere in this number of the "JOURNAL" (see p. 719) to the resignation of Mr. T. Banbury Ball, Manager of the Rochdale Corporation Gas-Works, owing to his disagreement with the policy of the Gas and Electricity Committee, who recommended that electricity only should be supplied to 66 Corporation houses to be built. The policy of the Committee—which had been endorsed by the Housing Committee—was debated at a meeting of the Town Council last Thursday.

Alderman BLOMLEY, moving the adoption of the minutes of the Gas and Electricity Committee, said he should feel that he was very remiss in his duty, as Chairman of the Committee, if he did not refer to the resignation of his old friend, Mr. Ball. He would allude to the matter briefly, but none the less sincerely, because during the years he (the speaker) had been a member of the Council he had had the highest regard for Mr. Ball. As a public official, Mr. Ball had rendered exceedingly good service to the ratepayers; and he regretted very much the reason for Mr. Ball's retirement. They knew that the time came for men to retire from public service and from a life of activity, and on behalf of the Committee he could only say they deeply regretted the decision Mr. Ball had come to. ["Hear, hear."]

Alderman WATSON, referring to the Committee's decision to instal electricity only in 66 new Corporation houses, asked whether the Committee had had any communication with the prospective tenants with reference to the matter.

Alderman DIGGLE wished to know whether the decision was come to after hearing both sides.

Alderman DAVIDSON remarked that he supported the question put by Alderman Watson. He would also like to know the circumstances which led to the resignation of Mr. Ball.

Alderman BLOMLEY replied that he was not aware of any request that gas should be supplied to these dwellings. The Committee considered the whole question, and had acted in the usual business fashion. There had been no change of procedure between the Gas-Works Sub-Committee and the Electricity Sub-Committee in dealing with the various questions which had been brought before them. Consultations between heads of the departments had not been held on any previous occasion. Each Manager had brought forward what he thought right and proper for the success of his department. Such communications had been very carefully considered; and the decisions of the Committee and Council had been carried out.

Alderman WATSON was surprised that, in a manufacturing town like Rochdale, the Gas and Electricity Committee should decide against installing gas in 66 Corporation houses. He had raised strong objection at the meeting of the Housing Committee to this decision. Electricity was very useful in a house, but every one could not afford the extra few shillings a week to pay for electric fittings. What would happen, he asked, if, as had occurred, the electric supply failed for some hours—say, when dinner was being cooked? He hoped the Committee would consent to instal gas in these houses.

Councillor R. TURNER said he had hoped the Chairman would have told them something about the experience of other places, which had adopted electricity and no gas in a number of houses.

Alderman WYCHERLEY (the Chairman of the Housing Committee) pointed out that if the electricity supply failed when dinner was being cooked, the tenants would have the coal fireplaces to fall back upon. Looking at the question from the point of view of the Corporation, he understood that in many of the houses there was a very small consumption of gas for cooking purposes. The Housing Committee had ascertained that the following Corporations had installed electricity only (with coal-burning fireplaces) in a number of their houses: Hackney, Woolwich, Newcastle, Glasgow, Marylebone, Norwich, Bolton, Sunderland, Haslingden, and Manchester. A great deal had been said about the cost of installing electricity in these houses. Before deciding the Committee went into the question of cost, and, taking everything into consideration, they were of opinion that the sum was a very modest one, and within the reach of all the people in the town. As compared with gas, electricity was cleaner, healthier, and he believed it was now no more expensive in consumption, than gas. In the case of a particular house among those on the Spotland Estate, in which there was electric lighting and electric power, the cost was: For the September quarter, 15 units for lighting and 219 for power, which cost 1s. 9d. per week; December quarter, 2s. 7d. per week; March quarter, 3s. 7d. per week. He was given to understand, and he could substantiate it from his own personal experience, that it was possible to do the cooking and washing under the modern conditions as to electricity in an ordinary house—ordinary cooking and ordinary washing—for not more than 2d. and 3d. for both on one particular day. He did not think it would be argued that this was beyond the reach of the working man. Surely the Council ought to look forward; and the Committee were of opinion that electricity was a thing of the future, and gas to a large extent a thing of the past.

Alderman DAVIDSON prefaced his remarks with a tribute to Mr. Ball as an old and valued servant with a fine record of service. By his work and his high character, he had gained the respect, the esteem, and the goodwill of everyone with whom he had come in contact. Even the grounds of Mr. Ball's resignation did him credit; for what better proof could be had of a man's keen and conscientious devotion to his department than the action he had taken? He had made a sacrifice, and had shown that he really lived for his department. ["Hear, hear."] It did seem strange that the Council should be asked to go out of their way to say or do anything which would depreciate the gas undertaking in the eyes of customers or ratepayers. In some towns that had been mentioned the gas supply was in the hands of private companies, whereas in most cases the electricity supply was in the hands of the corporation. One could well understand the corporation pushing its own commodity in those circumstances, because in some cases they were out to purchase the gas undertakings, and by reducing their value to get them on the best possible terms. In Rochdale, however, the Corporation owned both these monopolies; and yet they had gone out of their way—by the present policy—to say that gas was played out. At the same time the Gas Committee were proposing to spend £40,000 or £50,000 on their undertaking. In his opinion a very strong case was made out for a separate and independent committee to control the gas-works. He was afraid there might be some difficulty in getting a first-class man to undertake the management of the Gas Department if the Corporation was going to say that they were biased in favour of electricity. Mr. Wycherley had said that the income from gas in respect of the Corporation houses was very small, and that the tenants had really settled the matter themselves. He had heard it stated in the Finance Committee that the gas accounts of these houses were as low as 3d. per house. What were the facts? The capital expenditure on 557 houses for electricity was £5076; for gas £5093. The income from electricity was £141, and from gas £1332, or £2 6s. per house —representing a return of 26 p.c. of the capital outlay. Mr. Wycherley said that there was a small consumption of gas for cooking purposes in these houses; but as a matter of fact there were over 400 gas cookers in use in the 557 houses. No gas was available for lighting because electric fittings had been put in. He hoped the Committee were right in their calculations, and that taking into account the cost of appliances the electricity service would be no dearer than gas. The rents of these houses were high enough; and if on top of the rent the tenants were going to be forced to pay more for electricity than they would have had to pay for gas, it would add very materially to the cost of living. By excluding a gas service from the housing estate the Corporation was virtually proclaiming that gas had been played out, and he was rather disturbed by the proposal.

Alderman CLARK said no one regretted more than the Committee themselves the attitude which had been taken by Mr. Ball. Alderman Blomley and himself had been deputed by the Works Sub-Committee to wait on Mr. Ball and ask him to withdraw the reason given for his resignation. They tried by every possible means to persuade him to do so, because they felt that the service which he had rendered to the Corporation and the town was too good to be spoiled by a reason of this kind. The Committee regretted exceedingly that Mr. Ball should have adopted this as a reason for giving up. The Committee believed that there was a great future for gas as well as for electricity. But on the present occasion the Committee, he believed, were acting in the interest of the Corporation, and the Housing Committee were also of that opinion. They believed that they would be able to save something like £30 or £40 per house by adopting the policy which was recommended. In these circumstances were not the Committee justified in trying an experiment which had already been tried in a number of other towns? One often heard random statements about the cost of electricity, but, as the Council knew, it was a commodity which was coming nearer to the pre-war price than any other commodity he could mention.

Mr. LORD said the Committee were merely desirous of making an experiment. He added that the installation of a dual service of gas and electricity on the Spotland Estate had been criticized by the Ministry of Health, who were of opinion that one service was redundant.

The minutes were passed; Alderman Watson alone opposing them. Similarly, after discussion, the minutes of the Housing Committee were approved—Alderman Watson dissenting.

SAFEGUARDING OF INDUSTRIES ACT.

Gas Mantle Inquiry.

The Committee appointed by the Board of Trade (and presided over by Sir Frederick Mills) to consider the application of the Incandescent Mantle Manufacturers' Association for an import duty on foreign gas mantles resumed their inquiry at the Offices of the Board of Trade, in London, on Thursday, June 4. (The previous proceedings were reported in our issues for May 27, p. 610, and June 3, p. 678).

The whole of the morning session of over three hours was occupied by a long cross-examination of Mr. G. P. H. Soper (for the Mantle Manufacturers' Association) by Mr. Macaskie (who represented the importers opposing the application).

Mr. Macaskie's first questions were put with the object of obtaining an admission from Mr. Soper that the prices of British mantles were fixed by the Association. It was not one of the objects of the Association, said Mr. Soper, to fix prices at which mantles should be sold to wholesalers and retailers. There was an agreement between some of the members of the Association with regard to prices, but the whole of the members of the Mantle Manufacturers' Association were not members of the body who sold at agreed prices. He agreed that a suggestion to the effect that travellers of British manufacturers found no competition from other British manufacturers because prices were fixed between them was substantially correct.

Mr. MACASKIE suggested that, if the British manufacturers had the market to themselves, protected by a very large duty, the price to the consumer would go up very considerably.

Mr. *Soper* felt certain that it would not; the British manufacturers were business men, actuated by ordinary commercial honesty. Even if they were not, however, they had in mind that the duty, if imposed, would be operative only during the pleasure of Parliament, and there might come a time when they would have to ask for it to be renewed.

Asked if he would agree that the German mantle was as good as the British, Mr. Soper said that when he had last compared them his tests had shown that the British mantles were slightly better, but not appreciably better, than the German.

With regard to the importance of the industry from the national point of view, witness said that mantles were used by 8½ million consumers. The number of people who benefited was more than 8½ millions. Another reason why the gas mantle industry was important was that gas at the present time was probably the predominant

source of artificial light in this country. Without the gas mantle, the gas as produced to-day could not be used for lighting.

Mr. MACASKIE pointed out that witness had said that a duty was necessary because the industry in this country was being destroyed by unfair competition, and he asked how it was able to exist before the war, when competition from Germany was keen.

Mr. *Soper* replied that the manufacturers could not carry on their businesses indefinitely in the way they were doing at present. Replying to further questions, Mr. Soper would not agree to the suggestion that the gas mantle industry was a declining one. He admitted that electric light was a serious competitor, but it had not made any material difference, so far as the manufacturers could see, in sales of gas mantles up to the present. If they lost sales in one direction, they picked them up in another; and it was everybody's experience that there was an increased sale of gas burners.

On the question of what was considered to be importation in normal and abnormal quantities, witness said that, having regard to the importance of the industry, he considered that 10 or 15 p.ct. of the total home consumption was a normal amount which might be allowed to come in. The duty should not be of such a heavy nature that it would exclude all foreign mantles, and if only 10 or 15 p.ct were coming in now, he did not think the present application would be made. Asked why he did not suggest that all imports should be stopped, he said he wanted to be fair; British manufacturers did not object to fair competition. He would not agree with Mr. Macaskie that the British mantle industry constituted a trust.

Mr. MACASKIE then put questions with regard to the amount of capital invested in the industry, and ascertained that it was turned over once in 2 or 2½ years at present values. He suggested that that was not a very satisfactory position for an efficiently-conducted industry. The capital invested was about 1½ millions.

Witness pointed out that large extensions of equipment had been made at war-time costs.

The CHAIRMAN said the point was that, if the manufacturers had to carry out extensions again, they would not do it when such high costs were prevailing. He agreed that the Committee had to determine whether the industry was carried on efficiently, but not whether the manufacturers had paid too much for their efficiency.

It was suggested by Mr. Macaskie that there was room for speeding-up production, but witness did not think so. The girls did an honest day's work for their wages, and he had not detected evidence of "going slow" in any factory. Mr. Macaskie suggested that output might be improved by about one-third without much difficulty, but Mr. Soper considered that impossible. Witness did not agree that there were at present too many mantle factories, and that the best two factories could cope with the present home consumption more efficiently and more economically than the existing six factories. In his view, the factories now running could supply the whole of the home demand comfortably, working on full time.

Suggestions were then made by Mr. Macaskie that the German mantles imported into this country were actually offered for sale at 24s. or 25s. per gross, which would compare with the 26s. per gross, the lowest price at which British mantles were offered. Therefore, it was ludicrous to suggest a flat-rate duty of 10s. per gross on German mantles. Mr. Soper did not agree, because the price of 24s. or 25s. represented a profit on re-sale.

Asked by the Chairman why he did not object to Dutch competition, witness said that *bona fide* Dutch competition was very small, and, to be perfectly frank, the manufacturers felt they would have more difficulty in making out a case against Holland than against other countries. As to the possibility of sending British mantles to Germany, he said the import duty into Germany was about 8s. or 8s. 6d. per gross, and nothing but price prevented British manufacturers from selling in Germany. As to the suggestion that the British mantle manufacturers controlled the thorium trade, witness said that one of the mantle manufacturing companies had an interest in thorium, but did not control the price.

In re-examination, witness said that if the demand on the thorium nitrate, ramie yarn, and clay ring factories in England were decreased, they might have to close down, or charge more for their products. He knew of one ramie yarn factory and two or three thorium nitrate factories which had closed down, due to decreased output.

OPPONENTS' EVIDENCE.

Mr. *George C. Sharp* (Agent for the Export Gasglühlicht Gesellschaft, of Berlin) said in evidence that he sold mantles for the German firm to wholesalers and retailers in this country. He handed-in a confidential statement showing the number of mantles which he had sold since 1922, and the prices at which he had sold them. The average import prices of German mantles in 1924 and 1925 which had been given by the applicants, and taken from the Customs returns, he did not regard as representing accurately the prices at which the mantles were sold or offered for sale in this country. They were misleading because they were average prices, and did not state what mantles were referred to. Cheaper mantles than the ordinary standard mantles were imported from Germany; and if they were included in the Customs returns, they would reduce the average prices. Though he had heard statements as to the obliteration of the statement of country of origin on boxes containing foreign mantles, he had not found evidence of this.

MR. TALBOT CROSS-EXAMINED.

Mr. *H. Talbot* (General Manager, Welsbach Light Company, Ltd.) was recalled for cross-examination. At the request of the Committee, he handed in the balance-sheets of the Welsbach Company for the last five years.

The CHAIRMAN, after examining these, said the dividends had been reduced from 15 to 5 p.ct., and a dividend was still being paid on the ordinary shares, chiefly out of reserves.

Witness was cross-examined by Mr. Macaskie as to the information he had given at the previous hearing regarding the wages paid in German factories, and it was suggested that the information was inaccurate. Mr. Talbot said he had every reason to maintain confidence in his figures. He did not wish to disclose publicly the sources of his information, but handed to the Committee a confidential statement of that information, showing the sources from which it was obtained.

With regard to wages paid to girl employees in Germany, Mr. Macaskie said that the amount paid to workers under 19 years of age was 5d. per hour, as against the figure of 2·78d. given by Mr. Talbot, and for those over 19, 5¼d. per hour, as compared with Mr. Talbot's figure of 4¼d.

Questioned as to the prices at which German mantles were sold in this country, Mr. Talbot produced copies of reports from travellers of the Welsbach Company relating to customers who had bought German mantles, and stating the prices at which they were bought. These prices ranged from 18s. to 28s. per gross.

OPPOSITION EVIDENCE RESUMED.

Mr. *Louis Scal* (Director of Messrs. Littleton, Rose, & Co., Ltd., General Traders, of London) gave evidence for the opponents, and said that before the war he was the sole selling agent in this country for the Auerlicht Company, of Austria. The Company did not import at present, because they could not make it pay. He also gave figures as to the prices at which that Company's mantles had been sold here.

The CHAIRMAN remarked that what they had to find out was whether the competition was unfair, and whether the English factories were efficient.

Mr. MACASKIE said he wanted to make it clear that the selling price of German mantles in this country was 24s. or 25s. per gross, as compared with the price of about 21s. which was given by the applicants as the selling price of German mantles.

The CHAIRMAN said the Committee were satisfied with that evidence.

Herr *Heinrich Zeigler* (Managing Director, Deutsche Gasglühlicht Gesellschaft, Berlin), in evidence, said that his Company produced 50 p.ct. of the gas mantles now manufactured in Germany, and before the war they controlled the Welsbach Company. The deposits of monazite sand at Travancore, which it was said were in German hands, had been lost to the Germans. Thorium was sold in Germany at present at 10s. per kilo, and the key industries duty when imported to this country amounted to 33⅓ p.ct. of that; on a gross of mantles it represented about 9d. He agreed that the price of ramie yarn was about the same in Germany as in this country. With regard to wages, he gave details of the increases which had been made since 1923, and said that the hourly rate paid to girls over 19 years of age, including the employers' contribution towards insurance premiums, &c., amounted to the equivalent of 6d. per hour, which compared with 6¾d. per hour paid in this country. As to efficiency in Germany, he said that the quantity of mantles produced in a given time by a given number of workers had increased since 1923. He had not seen the Welsbach and Falk-Stadelmann works at Wandsworth and Earlsfield since before the war; but if they were at present equipped as well as they were before the war, he should say that his own Company's works were as good as those. His works in Germany were equipped with modern installations.

Dealing with the consumption of gas mantles in Germany, he considered that at present it was about half what it was before the war. In reply to Mr. J. Arthur Aiton (a member of the Committee) he said that he had not taken account of Germany's territorial losses, but, even taking these into account, he considered the reduction in the consumption of mantles was about 45 p.ct. His Company's exports to Holland had decreased since the war to a greater extent than the consumption in Germany had decreased.

Replying to questions by the Committee, witness said that labour represented about 30 p.ct. of the cost of production of the mantle. The wholesale price in Germany of similar mantles to those sold here at 24s. 6d. per gross was 21s. 6d. per gross. The carriage, freight, and insurance charges between the German factory and the English port of discharge were about 3s. per gross, so that his Company did not sacrifice anything between the two countries. As to the import duty on mantles imported into Germany, he was indifferent as to whether or not that was taken off. He was giving evidence in the present instance because his Company were responsible for more than 50 p.ct. of the mantles imported into this country.

The CHAIRMAN said he was not in a position to make a bargain, but asked witness whether, if this country and Germany entered into an agreement not to impose an import duty into either country, he would be prepared to beat the Britisher on his own ground.

Witness agreed. As to the number of employees, he said that two years ago, when labour was cheap in Germany, his Company employed from 1000 to 1100 workers; to-day they employed 760, and obtained a greater output.

The CHAIRMAN obtained a promise from the witness to produce at the next sitting of the Committee copies of the recent wages agreements made.

Witness, replying to Sir John Barran (a member of the Committee), said there was nothing in the nature of State control in Germany, and there was no restriction on export. With regard to the consumption of mantles, he said it was the experience throughout the world that less gas burners were used than previously, and that electricity was taking the place of gas for lighting. Great Britain might be an exception.

This concluded Herr Zelgler's public evidence, and he gave information to the Committee privately with regard to costs of production.

In the course of a discussion as to the evidence which will be heard at the next sitting, the Chairman said attention would be directed mainly to wages and costs of production abroad. Further evidence as to the selling prices of foreign mantles in this country, which the opposition have available, was held over for the time being, and will be given if it is considered necessary. Commenting on the question of the alleged deception of British users through the obliteration of the notice of country of origin from the mantle boxes, the Chairman intimated that this fell to the ground as soon as samples of these boxes were examined.

The Committee were of opinion that it was not necessary to hear evidence from Poland, though they did not wish to exclude it.

The Committee adjourned until Tuesday, June 9.

SOUTH SUBURBAN GAS COMPANY'S CO-PARTNERSHIP.

Meeting at the Crystal Palace.

On Saturday last, the co-partners from the various stations of the South Suburban Gas Company met each other and the Directors and officials, at the annual gathering at the Crystal Palace, which is always so much looked forward to by them as an opportunity of showing their faith in co-partnership, as a chance for social intercourse, and as holding out promise of a thoroughly enjoyable afternoon. This year's meeting proved no less enthusiastic, and no less successful in every respect, than its predecessors; but there was one matter on which keen regret was eloquently expressed and even more deeply felt—and that was the absence of Mr. Charles Hunt, who, as the Chairman of the Company, and a thoroughly staunch supporter all along of the enlightened policy which is followed in that undertaking, has endeared himself to all who are in any way connected with it.

Quite early in the afternoon, co-partners, with their wives and children or sweethearts, filled the large theatre in the Palace, and thoroughly enjoyed a concert by the Livesey Hall Silver Star Minstrel Troupe—a large company who proved themselves as expert in their parts as one could possibly wish, under the musical direction of Mr. G. Piper. At the co-partnership meeting which followed, Sir J. FORTESCUE FLANNERY, Bart., presided, and he was supported on the platform by the other Directors, together with the leading officials of the Company and of the co-partnership.

CO-PARTNERSHIP AS A CURE FOR UNEMPLOYMENT.

The CHAIRMAN, on rising, expressed his pleasure at seeing so large an attendance, and his regret—and the regret of all of them—that their dear old friend, Mr. Charles Hunt, was not well enough to be with them. His health had of late not been what they would all have desired. Every one of them would look forward to the possibility of his restored health, and his coming among them once again, with all that geniality and friendliness which had distinguished him for the last quarter of a century in connection with this Company. With each year, as it rolled by, their faith in co-partnership as a system and as a remedy grew and increased. They heard much in the present day about unemployment, and knew that there were something like a million or more of willing workers throughout the country who were without work, however gladly they would take it. It was a serious national misfortune—a problem most difficult to understand and to remedy. Orders were going abroad which a few years ago would have come to this country as a matter of course; and he had often marvelled that the great remedy which they and others in the gas industry had demonstrated by example had not been more generally adopted throughout the manufacturing trades of this great country. It was a remedy by which every worker had a direct interest in the ultimate results of his employment, so that if the whole enterprise was successful he would share in the profits, and feel that every exertion he had made had been a contribution to the common fund from which he is not excluded, as he was by the present system other than co-partnership. By this system of co-partnership, economic production would be increased. The gas industry had led the way, and the South Suburban Gas Company was well in the front rank. It was now nearly thirty years—certainly a quarter of a century—since he first became associated with the late Sir George Livesey in connection with co-partnership. It was just thirty years—from 1894 to 1924—that the record of co-partnership had existed in this Company. The total amount of bonus—quite independent of, and in addition to, the ordinary full standard wage—in these thirty years that has been distributed, not as a gift, but as a matter of contract and right, among the workers of the Company, had been no less than £108,000. This was a very large sum, even over a period of thirty years. To-day the co-partnership system of their Company had 66 pensioners, who held as stockholders £15,000, or an average of over £200 each, in the Company. People might talk about old-age pensions, and about what the State did for them, but where could one find anything equal to this? Here were 66 pensioners—not all of them of the full age, but some in bad health—and the Company did not say to these pensioners: "Have you got other money? Have you anybody else to help you?" Not at all. If they had a claim through age or the state of their health, never mind what they had in the Company, the pensions were awarded according to rule. There were certain very strict rules—and necessary rules, of course—so that justice might be done towards those who continued to work and produce the money that paid the pensions to those who received them. But whenever there was any doubt as to whether a rule applied, the benefit of that doubt was given in favour of the man, and against the Company. Another development to which he ought to call their attention was the reduced number of accidents in the course of the working. This reduction, he believed, might be attributed to several causes. First of all, as they gained experience, they got to know what to avoid so as to secure "Safety First." Secondly, the system of inquisition—of a formal examination—into every accident that took place, be it small or great as regarded injury to the man involved, was thoroughly and carefully carried out. Anybody was heard who could give testimony about the accident, or as to what could be done to prevent a similar happening in the future, and every possible investigation was undertaken. Now they were reaping the reward of this system, because the number of accidents had decreased; and he looked forward to the time when this decrease would be even greater than had been the case up to the present. The workers themselves saw that "Safety First" was a prime consideration—a duty to those who were dependent upon them, a duty to themselves, and a duty to the co-partnership system. A man should run no unnecessary risks. This recognition had been, as he believed, one of the contributing causes to the reduction in accidents—which testified also to the steadiness of the men and their very great care. He never came to a meeting connected with co-partnership without recalling the saying of Sir George Livesey, the father of co-partnership, that the worker was at first a slave, next a wage-earner, and then a co-partner or share in the enterprise. They had reached the third stage; but they had not yet reached the top. There were many good workers who were worthy of co-partnership, but who had not yet been afforded entrance into the nest. But the system was well established; and again he said if any doubt was raised as regarded rules on the question of the admission of any individual to co-partnership, this doubt would be decided in favour of the man, so that, after reasonable trial of his skill and his steadiness, and his worth and deserving to become a co-partner, the co-partnership agreement would be given to him.

CO-PARTNERSHIP FUNDS AND ACCOUNTS.

Mr. JOHN BAKER (Secretary of the Co-Partnership Committee) then submitted the co-partnership account for the year 1924, which showed that the amount of bonus credited to 1407 co-partners was £11,617—being at the rate of 4¾ p.ct. on salaries and wages. The savings exceeded the withdrawals by £1300. A summary of the co-partnership accounts from 1894 to 1924 showed total bonus credited £108,028; and net savings £23,711. With interest, &c., the total sum was £140,903. Of this, £111,754 had been invested in stock, leaving a balance of £29,149. In addition to this balance of £29,149, 1125 co-partners now held £84,988 of ordinary stock of the Company, and 66 pensioners £15,228 of stock. He again pointed out how important it was that all employees possessing over £100 should make a will. The number of accidents which occurred last year was much smaller than in the previous year. The figures were: Last year, 74 accidents, equal to 41 per 1000 men employed, as against 96 (or 60 per 1000) for 1923. This was a reduction of nearly one-third.

THE WORKS COMMITTEE.

Mr. F. CARTER (Secretary of the Works Committee), in presenting the report of the Committee, drew attention to a recent statement of Mr. Baldwin, that an employer who failed to comprehend human nature was not fit to be a leader of men—that the management of the concern was not scientific if it failed to recognize the man in the employ. Mr. Baldwin said that, if they were to make any progress, employers must recognize the necessity for consulting their employees to a far greater extent than they had done in the past; they should offer consultation to the workers on routine, management, and other questions. Again, Mr. Baldwin said there was room for a more intimate relationship in industry than had been experienced in the past. Well, the co-partnership system of this Company was a shining example of all, and more, of the things that Mr. Baldwin thought would stand for progress. They had had for many years that more intimate relationship to which Mr. Baldwin had referred. The Works Committee had always meant far more than mere consultation; they had had powers of a far wider nature than this. They had the power of making representations on behalf of all or any of the workers; they had power to negotiate any matter that came up; and there had been times when the Committee had even had judicial powers. The object and the motive with which the Committee started their work in 1918 were still their object and their motive. He hoped that before very long practically every employee in the Company would have an opportunity of becoming a co-partner.

On the proposition of Mr. T. ANSET, seconded by Mr. F. REED, the report of the Works Committee was adopted.

VIEWS OF DIRECTORS.

Dr. CHARLES CARPENTER remarked that he was very glad to have a chance of again expressing his belief in the principles of co-partnership. He had known Sir Fortescue Flannery for a great many years, and during the whole of that time as an ardent preacher and supporter of co-partnership; and it was a great pleasure to find that his enthusiasm grew greater the longer his association with co-partnership continued. He would also take the opportunity of adding his voice to the regrets which had already been expressed at the absence of Mr. Hunt. Like the Chairman of the present meeting, Mr. Hunt had loyally and consistently, from the very first day of his association with the Company, supported the co-partnership principle; and he thought it would be a kindly act on their part that afternoon to send a message to Mr. Hunt expressing the regret of all the co-partners at his not being present, and assuring him of their continued gratification at his loyal support over so long a period of the co-partnership principle.

Mr. W. G. WALLER seconded the proposal that they should send a letter of sympathy to their beloved Chairman. He also thanked Sir Fortescue Flannery and the other Directors for their very kind invitation to the co-partners that day. There were some present who had come over a hundred miles to attend; and this showed the great interest that was taken in these yearly gatherings. If co-partnership were universally adopted in this country, there would not be over a million of men out of work to-day. They must make of co-partnership a continued success, and then the prosperity of the Company would be assured.

The CHAIRMAN: I shall ask you now to vote upon the motion that a letter of goodwill and encouragement be sent to Mr. Charles Hunt, expressing thanks for his past services to us, and the hope that he will soon be among us again. That is carried unanimously.

Col. J. H. BORASTON also expressed regret at the absence of Mr. Charles Hunt, and his own belief in the principles of co-partnership. He thought these principles were extending gradually throughout the country. In a time of stress in industrial matters such as was now being passed through, men's minds—both employers and employed—were beginning to turn less to their rights and more towards their duties and responsibilities to each other. This, to his mind, was the underlying motive of co-partnership.

Mr. HAROLD GUNDRY remarked that a meeting of this description brought home to one the strength and vitality of co-partnership. As each year came round, he thought they realized more and more the importance of co-partnership to the country. However great an optimist a man might be, he could not think that all was well with industry at the present moment. There was much unemployment. Unfortunately there were dissensions between capital and labour, and foreign countries were quick to notice their chance, and were hurrying to take advantage of the situation and oust this country from the markets of the world. The remedy was co-partnership, which linked

together all parties in true comradeship. One of the most important ingredients of co-partnership was that there should be representation on the Board of Directors, because a man could not feel himself really in partnership if he had not, by himself or his representative, an interest in the management of the undertaking. What their Company had done other companies could do; and he hoped that before long every important undertaking in this country would adopt the great principle of co-partnership.

Mr. JOHN TERRACE (the Chief Engineer) and Mr. WILFRID WASTELL (the Secretary) made some observations particularly affecting the co-partners of the Company, after which a "Safety First" badge and several diplomas were distributed among the drivers of the Company.

Mr. MORRIS INGHAM proposed a hearty vote of thanks to the Directors for their attendance that afternoon. The co-partners, he said, looked forward keenly to these occasions, when they could meet not only their fellow workers, but also the Directors of the Company. [Applause.]

Following Sir Fortescue Flannery's acknowledgment of the vote, the company were entertained at high tea.

NEW GAS-WORKS FOR BURNLEY.

Mr. H. E. Byrne, of the Ministry of Health, conducted a Government inquiry at Burnley last Thursday into the Corporation's application for sanction to borrowing £250,000 for the construction of new gas-works at Old Hall.

The Town Clerk explained that, while the nominal capacity of the existing works was 4½ million c.ft., actually it was not possible to rely upon making more than 3 millions; and as the highest consumption in one day had already reached 3¾ millions, it was clear that the present plant was inadequate to meet the town's present requirements, not to speak of future needs. The total storage capacity was 5½ millions, or 1½ days' supply of gas. The outstanding loans amounted to £117,478. Last year there was a net profit of £28, against £13,827 the year previous. The Gas Engineer said this difference was due to a depression in the industry which had been felt throughout the country; and in consequence the Council had decided to increase the price of gas to cover any possible deficiency. The Inspector drew attention to the fact that the estimated total expenditure was £300,500; and the Town Clerk said that next month the Council intended to apply for aid from the Unemployment Grants Committee. They would then pass a resolution dealing with the difference.

The Inspector said the Council ought to face the facts squarely. The Town Clerk then asked that the application should be regarded as for £300,500.

The gas undertaking, it was stated, had contributed to the relief of rates since 1864 £207,426. The Council had already acquired 23 acres of the land required for the site of the new works. Referring to the old plant at Lanebridge, the Town Clerk said it was very much congested, and had no railway facilities, which meant dependence on canal transport. The Council were of opinion that new works were the most economical proposition, as the old plant, which was installed over thirty years ago, was in an unreliable condition. Maintenance charges consequently were very high, and risk of breakdown considerable; in fact, the Gas Engineer assured him that it would be difficult to meet existing demands if there was a breakdown.

There was no opposition to the application.

GAS EXHIBITION AT NEATH.

A highly successful gas exhibition was held recently by the Neath Corporation Gas Department, at the Gwyn Hall, Neath. The exhibition was opened by the Mayor (Councillor Richard Jenkins), who was supported by members of the Gas Committee, Mr. W. Clark Jackson (Engineer and Manager), and a number of engineers and managers of works in South Wales—including Mr. W. H. Johns (Swansea), Mr. J. H. Canning (Newport), and Mr. J. E. Kenshole (Merthyr Tydfil). The Mayor spoke of the energy and skill put into the gas undertaking by Mr. Jackson; and in the speeches of Mr. Johns, Mr. Canning, and Mr. Kenshole, reference was also made to the excellent work done by Mr. Jackson, both on the works and on the district—it being remarked that Neath ought to be proud of having such an Engineer.

The exhibition consisted of four demonstration rooms, set-out as dining room, drawing room, kitchen, and bathroom. They were furnished in a tasteful manner by the South Wales Furnishers, and fitted with the latest designs of gasfittings, gas fires, hot water equipment, &c. There were also a number of tableaux displayed around the hall representing the usefulness of gas, and two large stalls—one showing heating and cooking apparatus, and the other gasfittings. The cooker stall was arranged by Radiation Ltd., and the gasfittings by Messrs. Falk, Stadelmann, & Co., Ltd. Cookery lectures and demonstrations were given twice daily by Mrs. Dora Rea.

During the week it remained open the exhibition was attended by approximately 6000 people, and the turnover of business in sales amounted to about £1200.

A children's essay competition was also organized; 24 selected scholars (12 boys and 12 girls) from each of the schools in the district taking part in this. The essays were of a high standard, and caused great interest, as was shown by the large attendance of parents and scholars at the final lecture, at the conclusion of which the prize-giving took place—the prizes being presented by Mrs. Jackson, the wife of the Gas Engineer.

Excellent results have accrued from a series of lectures and demonstrations on the use of gas in cookery at the showrooms of the Alliance and Dublin Consumers' Gas Company. Miss Bonham Carter was the lecturer and demonstrator, and she had large and interested audiences.

WHESSOE FOUNDRY AND ENGINEERING COMPANY.

Satisfactory Results in Difficult Year.

The Fifth Annual General Meeting of the Whessoe Foundry and Engineering Company, Ltd., was held last Friday at 8, Frederick's Place, Old Jewry, E.C., Mr. H. S. SMITH-REWSE presiding.

Mr. S. LANGFORD (Joint Secretary) having read the notice convening the meeting and the report of the Auditors,

The CHAIRMAN said: Gentlemen,—I regret that our Chairman is absent to-day, owing to the illness of his wife abroad, and your Directors have asked me to take the chair in his absence. I presume that, as usual, I may take the Directors' report and accounts as read. [Agreed.]

The results of the past year are, I think, on the whole, satisfactory. At our last meeting we expressed the hope that the trade depression was showing signs of improvement; but, unfortunately, the outlook at present still seems far from clear. Prices are still very keenly cut; and it is only by the closest attention to efficiency and economy in manufacture that we have been able to maintain our profits on such a comparatively satisfactory level through a difficult period.

There are no alterations in our balance-sheet from last year to which I should draw your attention, except that our work in progress has fallen; but I am glad to tell you that since the date of this balance-sheet we have received our fair share of orders, which should keep the works employed.

NEW MANAGING DIRECTOR.

During the year we suffered a very great loss by the death of our Managing Director, Mr. Alfred Coates, who had been connected with the works practically since boyhood, and to whose energy and ability the success of the Company must in large measure be attributed. This loss at such a time of depression in trade was bound to increase our difficulties; and I think we should congratulate our management and staff on the manner in which, in spite of this sad event, they have succeeded in carrying on the work.

I am glad to say that we have been very fortunate in securing the services of Mr. R. B. Hodgson (who to-day is Director and General Manager of Messrs. Ashmore, Benson, Pease, & Co., Ltd.). He will join the Company as Managing Director on the 1st of July, when the Directors propose to elect him to a seat on the Board. Mr. Hodgson has had great experience of the trade in which this Company are engaged, and I am glad he is able to be present with us to-day.

I now beg formally to propose the adoption of the report and accounts. I will ask Mr. Cripps to second the motion; but before putting it to the meeting, I shall be glad to answer any questions.

The Hon. A. H. SEDDON CRIPPS seconded the resolution, which, in the absence of questions, was carried unanimously.

The CHAIRMAN: I now have pleasure in moving: "That a dividend of 10 p.ct., free of tax, as recommended by the Directors, be paid for the year ended March 31, 1925;" and if you approve of this, the dividend warrants will be posted to-morrow.

Mr. CLAUDE M. SPIELMAN seconded the motion, which was unanimously approved.

Mr. HARRY CLAYTON proposed the re-election of Mr. H. S. Smith-Rewse as a Director, which was seconded by the Hon. A. H. SEDDON CRIPPS, and passed unanimously.

The Auditors (Messrs. Peat, Marwick, Mitchell, & Co.) having been re-appointed, the proceedings terminated.

Flats Specially Built for Gas Fires.

A new departure in flat construction which, owing to its great saving in costs, is likely to be widely adopted, is to be introduced in a block of labour-saving flats at Knightsbridge Court, Knightsbridge. The foundation is being laid in this thoroughfare of a ten-storey building, which will embrace sixty labour-saving flats of varying dimensions, each specially constructed for the use of gas fires. The chief novelty from an architectural point of view is the abolition of the chimney. In place of wide brick chimneys, narrow flues constructed with "Nautilus" cast-concrete gas flue-blocks will be installed. These blocks have been approved by the Ministry of Health and the London County Council. By dispensing with the ordinary chimney, structural economies will be effected. In doing away with foundation concrete, brick footings, projecting chimney-breasts, trimmers, skewbacks, arches, concrete hearths, and large brick chimney-stacks, it is estimated that about 500,000 bricks will be saved. On each stack the economy will be as much as £100.

Omagh Gas Undertaking.—The past year's working of the Omagh (Co. Tyrone) Gas-Works shows a profit of £1479, as compared with £1679 in the previous year, the decrease being attributed to a reduction in price of gas from 6s. 8d. to 5s. 10d., which came into operation in the March quarter, and the increased expenditure on gas cookers and retorts.

Nelson Gas Department.—In his report for the year ended March 31, Mr. James Mitchell, Engineer and Manager of the Borough of Nelson Gas Department, says that the net profit was £7277. The total quantity of gas made was 531 million c.ft., all of which was coal gas. The net income from residuals amounted to £20,715, compared with £25,078 last year, which gives a return of 15s. 4d. per ton of coal carbonized, as against 17s. 11d. last year. As compared with the previous year, ordinary meters show an increase in consumption of 1·77 p.ct., and prepayment meters 6·69 p.ct., making a total increase of 4·31 p.ct. The unaccounted-for gas stands at 4·1 p.ct. During the year 354 gas cookers, boilers, fires, &c., were sold outright, and 624 appliances on the hire-purchase system. The Brierfield installation of vertical retorts has been reconstructed, and the expenditure has been fully compensated by an increased production of gas and residuals per ton of coal carbonized.

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

Business has entirely failed to benefit from the Whitsuntide holiday, and many collieries extended the break beyond the Monday. Idle time has been more than ever rife, and notices are still being given almost daily. Prices have been lower than ever, and buyers who have orders to place for prompt shipment can more or less make their own terms.

It is becoming more and more obvious that the collieries will just have to carry on as best they can, and cut losses as far as possible, until the crisis which is bound to come at the end of the present agreement.

Gas coals, like all others, are in very meagre demand. Wear Specials quote 18s. 9d., and best qualities 18s. 3d. to 18s. 6d. f.o.b. These prices are purely nominal, and prompt sales are subject to negotiation. Seconds, likewise nominally, are 16s. 3d. to 16s. 6d. Unscreened coking is 15s. 9d. to 16s. 3d., and a very limited market; supplies of all qualities being freely offered. Best Durham bunkers are weaker, and obtainable at 16s. 6d. to 16s. 9d.

The loss to collieries at these f.o.b. prices amounts in most cases to shillings a ton, and still they are too high to compete successfully for such limited business as is offering in the Continental markets.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

There is no material alteration in the Yorkshire and Lancashire coal trade this week.

Gas coals continue to be placed on the contracts over twelve months, and evidently there is a feeling that the next four weeks or so is the time to purchase owing to the general uncertainty likely to prevail throughout the trade during the next few months. Prices continue to vary, and there does not seem to be a generally stabilized price list, such as existed in more normal times.

House coal is naturally in small request, while there does not appear to be any improvement among the larger coal-consuming industries. The iron and steel trades may have a chance of recovering to some extent, seeing that furnace coke is now being put on the market at much reduced figures. This will enable British competitors to be more successful in the near future. Low prices continue to rule for the commoner grade fuels, and it remains to be seen what effect this will have after the holidays.

The shipping outlook continues abnormal. Although low figures are quoted for the various qualities, exporters report that there is no chance of an improvement for some time. With the possibility of increased working hours and the consequent reduction in the cost of production, it may be, however, that towards the latter part of the summer there will be an improvement.

The Humber bunker and export prices (f.o.b. usual shipping ports) are: South Yorkshire.—Hards, Association, 19s. 6d.; screened gas coal, 17s. 6d. to 18s.; washed trebles, 18s. to 19s.; washed doubles, 16s. 3d. to 16s. 9d.; washed singles, 15s. to 15s. 6d.; washed smalls, 10s. 9d. to 11s. 6d.; unwashed doubles, 15s. 6d.; rough slack, 10s.; smithy peas, 18s. to 19s. 6d. West Yorkshire.—Hartleys, 16s. 6d. to 18s.; screened gas coal, 16s. 6d. to 18s.; washed trebles, 17s.; washed doubles, 14s. to 15s.; washed singles, 13s. 6d. to 14s. 6d.; washed smalls, 10s. 6d. to 12s.; unwashed trebles, 16s.; unwashed doubles, 12s. to 13s.; rough slack, 9s. 6d. to 10s.; coking smalls, 9s. to 10s. Derbyshire and Notts.—Top hards, 19s. to 19s. 6d.; washed trebles, 17s. to 17s. 6d.; washed doubles, 16s.; washed singles, 14s. 6d. to 15s.; washed smalls, 10s.; unwashed doubles, 14s. to 14s. 6d.; rough slack, 9s. 6d. to 10s. Yorks, Derbys, and Notts.—Screened steam coal, 15s. to 17s.; gas coke, 19s. to 20s.; furnace coke, 15s. 9d. to 16s. 6d. per ton.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

Many gas undertakings are anything but eager to complete contracts for the new term. The course of the market gives some encouragement to the belief that by delaying they risk nothing and may enforce better conditions. Colliery managements that take the market position as standardizing prices of gas coal at from 2s. to 3s. below those which ruled a year ago are being told that supplies can be arranged with some of their competitors at a reduction of 5s. This is considered an exaggeration of the slump.

It is evident that some collieries are prepared to shade late prices rather than lose contracts. Stabilized prices are not to be expected in prevailing conditions. But a drop of 5s. is considerably more than collieries generally are prepared to entertain. It is suggested that the price agreed last year for high-grade coal is being compared with the price now quoted for low-grade coal to arrive at the difference of 5s. Notwithstanding the suspension of output during the Whitsun holiday, supplies of all descriptions of fuel continue greatly in excess of demand. Values have, therefore, further depreciated.

Iron and steel producers have not sufficient orders to warrant more than a partial re-starting even of the plants that were in operation down to the eve of the holidays. Further closing down of pits appears to be inevitable, and at many of these where coal getting has been resumed working hours are being further curtailed.

The half-yearly meeting of the Lampeter Gas Company was held last week—Major Harford presiding. The Directors submitted their report and balance-sheet for 1924, which showed a profit of £291. It was decided to apply this towards the reduction of the accumulated debt of previous years; the Directors being unable to pay a dividend.

TRADE NOTES.

New Holder at Clevedon.

Messrs. Thos. Piggott & Co., Ltd., of Birmingham, have secured the contract for a three-lift gasholder and framing, to replace one of the existing holders at the Clevedon Gas-Works, Somerset. The work is to be carried out under the direction of the Engineer, Mr. J. Harger Pye.

Cambridge Instrument Company, Ltd.

This firm have published a new list describing "Cambridge" automatic temperature regulators. Readers of the "JOURNAL" will be interested in the apparatus described, which has important applications in practically every branch of industry. Though the catalogue deals almost exclusively with the regulation of temperature, the regulators described can be applied with equal efficiency to the automatic control of humidity, pressure, and other physical conditions.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *June* 8.

There is no change to report in the position of pitch, the price of which remains unaltered.

Creosote also is unchanged at about 7d. to 7½d. per gallon.

Solvent naphtha, 95/160, is 1s. 9d. per gallon.

Pure benzole and pure toluole is 1s. 11d. to 2s. per gallon.

Tar Products in the Provinces.

June 8.

Markets for tar products generally are still very dull. There is practically no business doing for prompt delivery, while prices ruling are generally so low that there is no inducement to manufacturers to contract for forward.

Pitch is still very quiet indeed. Sales are reported on the Continent on the basis of 39s. to 40s. per ton f.o.b. England.

Creosote is steady. There is not a very large demand for home consumption, while as regards export buyers appear to have covered their immediate requirements, and apparently prefer to wait before booking for the latter part of the year.

Benzole is in good request at full prices.

Solvent naphtha is in good demand, and contracts are reported to the end of the year at fair figures.

Carbolic acid crystals are still neglected, and crude carbolic acid is very dull and difficult to sell.

Naphthalene continues depressed by the prices quoted by Continental manufacturers.

The average values for gas-works products during last week were: Gas-works coal-tar, 26s. to 31s. Pitch, East Coast, 39s. to 40s. f.o.b. West Coast—Manchester, 34s. to 35s.; Liverpool, 35s. to 36s.; Clyde, 38s. to 39s.; Benzole, 90 p.ct., North, 1s. 7½d. to 1s. 8½d.; crude, 65 p.ct. at 110° C., 1s. to 1s. 1d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 7¼d. to 1s. 8¼d. Toluole, naked, North, 1s. 6½d. to 1s. 7½d., nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8¼d. Solvent naphtha, naked, North, 1s. 5d. to 1s. 6d. Heavy naphtha, North, 1s. to 1s. 2d. Creosote, in bulk, North, liquid, 5¾d. to 6d.; salty, 5½d. to 5¾d.; Scotland, 5¼d. to 5½d. Heavy oils, in bulk, North, 6½d. to 7d. Carbolic acid, 1s. 5d. to 1s. 6d. prompt. Naphthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality unsaleable.

CONTRACTS OPEN.

Coal.

The Tipton Urban District Council are inviting tenders for the supply of 12,000 tons of gas coal. [See advert. on p. 757.]

The Denbigh Gas and Coke Company are inviting tenders for about 1900 tons of best screened gas coal. [See advert. on p. 756.]

The Teignmouth Urban District Council Gas Department are inviting tenders for the supply of 2500 tons of coal. [See advert. on p. 756.]

Tenders are invited by the Evesham Corporation for the supply of from 500 to 8000 tons of best screened gas coal. [See advert. on p. 756.]

Tenders are invited by the Keighley Corporation for the supply of about 35,000 tons of best screened gas coal, nuts, and slacks. [See advert. on p. 756.]

The Gas and Water Undertaking Committees of the Borough of Saffron Walden are inviting tenders for the supply of gas and steam coal. [See advert. on p. 756.]

Tar and Ammoniacal Liquor.

Tenders are invited by the Gas Committee of the Loughborough Corporation for the purchase of their surplus tar and ammoniacal liquor. [See advert. on p. 756.]

EXTENSIONS.

New Purifiers for Blackpool.

It is proposed to put down two new purifiers at the Blackpool Gas-Works, subject to the Unemployment Grants Committee authorizing a grant. This will entail application to the Ministry of Health for sanction to borrow £5500.

Questions Investors Should Ask.

One of the largest gas companies on the Pacific Coast recently issued a leaflet urging the advisability of prospective investors securing answers to the following twelve questions before placing their money in any enterprise of which they possess no personal knowledge: (1) Is the industry well established—that is, safely past the experimental stage—and showing a healthy growth? (2) Is the investment backed by actual physical property sufficient to justify the company's capitalization? (3) Has the security paid interest or dividends consistently over a period of years, and is it now yielding a satisfactory return, rather than carrying an indefinite promise of dividends at some time in the future? (4) Is the business stable in character, dealing in commodities for which there is at all times a ready market? (5) Is the territory in which the company operates progressive, presenting favourable opportunities for future development? (6) Does there exist an active market for the security, so that stockholders may sell their holdings at any time if occasion requires? (7) Has the business a sufficient working capital to meet any contingencies which may arise, even in those periods of industrial depression which inevitably occur from time to time? (8) Is the security of such character that your bank will accept it as collateral for loans? (9) What is the character of the company's management and personnel? (10) Is the enterprise of sufficient size to withstand the stress of active competition from other companies engaged in similar business? (11) Is there any assurance that the money paid for purchase of stock actually will be invested in the business, instead of going into the pockets of promoters? (12) Is complete information regarding the company's progress and operations available to stockholders?

Irish Gas Price Reductions.—The Newry Urban Council have reduced the price of gas by 5d., to 5s. 5d. per 1000 c.ft. Gas for heating and cooking purposes has been reduced in price by the Coleraine Urban Council by 5d., to 4s. 2d. per 1000 c.ft. In Strabane the price of gas has been reduced by 9d., to 6s. per 1000 c.ft.

Newbury Gas Department.—Owing to a reduction in the price of gas, the surplus on net revenue account for the past financial year of the Newbury Corporation Gas Department amounts to £281, as compared with £2452 for the previous year. The Auditor states that the cost of production and distribution compare favourably, and carbonization results show a substantial improvement. The percentage of unaccounted-for gas has been substantially reduced.

Malta and Mediterranean Gas Company, Ltd.—The audited accounts for the year ended March 31, which will be presented at the meeting next Tuesday, show that, after appropriating the sum of £4000 to reserve, the amount standing to credit of profit and loss account is £13,704. The Directors propose the payment of the dividends on the first and second preference capital, and a dividend of 3¾ p.ct. (free of income-tax) on the ordinary capital—making, with the interim dividend, 6 p.ct. for the year.

Leek Gas Undertaking.—At a recent meeting of the Leek Urban Council, the report of the Gas Engineer (Mr. R. H. Ginman) for the year ended March 31 was considered and approved. It was recommended that the price of gas to ordinary consumers in Leek be reduced to 3s. 6d. per 1000 c.ft., less a discount of 6d. per 1000 c.ft. for prompt payment, and that the price to ordinary consumers at Rudyard be reduced to 4s. 6d., with the same discount. It was also recommended that the discount allowed to prepayment consumers in Leek be advanced from 5d. to 8d. per 1000 c.ft., and to prepayment consumers in Rudyard from 4d. to 7d. per 1000 c.ft. The net results of the year's working showed a loss of £1900.

Lytham St. Annes Gas Department.—The accounts of Lytham St. Annes Gas Department show a loss of £1381 on the year. The revenue was £57,284, and of this £57,879 came from the sale of gas, £14,221 from residual products, and £3594 from services, fittings, &c. Gas sales show a decrease of £2000, and those of residual products £500. The total expenditure was £46,846, compared with £57,168 last year, while the costs of manufacture were reduced to £32,863, from £34,263. Distribution expenses fell from £13,638 to £7341. This year the gross profits were £10,438, against £4598 last year; but sinking fund and interest charges were £11,819, compared with £7567. The net loss last year was £2950.

Progress at Workington.—Alderman F. Hall (the Chairman of the Workington Corporation Gas Committee), submitting the annual report of his Department to the Town Council, congratulated Mr. Hedley Hoy (the Engineer and Manager) on the results attained. He said the progress made was of such a character as could not have been possible unless the coal had been wisely selected, the carbonizing plant up to "concert pitch," and the management and employees keen and reliable. The make of gas had been nearly 183 million c.ft., or 7½ millions more than in the preceding year; the make per ton of coal having been 20,396 c.ft., or 479 c.ft. more. The gas sold per ton was 19,058 c.ft., or 82·1 therms. The vertical retort installation has worked satisfactorily during the year.

Price of Gas at Hereford.—At the last meeting of the Hereford Town Council, the Gas Committee reported that, "in consequence of the serious slump in the value of residuals, amounting in the financial year just ended to £1067, and of the estimated further fall in value of £2400 during the current year, the Committee were compelled to recommend the Council to increase the price of gas, as from June 24, 1925, from 4s. 3d. to 4s. 9d. per 1000 c.ft., less the usual discount of 3d. per 1000 c.ft. for prompt payment. A corresponding increase was recommended to consumers on the prepayment system viz., by reducing the discount from 1s. to 6d. per 1000 c.ft." Mr. Oatfield, who moved the adoption of the report, in the absence of the Chairman (Alderman C. Witts), mentioned that, whereas the income from residuals per 1000 c.ft. of gas was 11d. in 1904, and 2s in 1921, it was only 8d. last year. During the past two years, the Committee had endeavoured to give the citizens cheap gas, which had resulted in serious losses; and now they thought it fair to ask consumers to pay a reasonable price. The report was carried.

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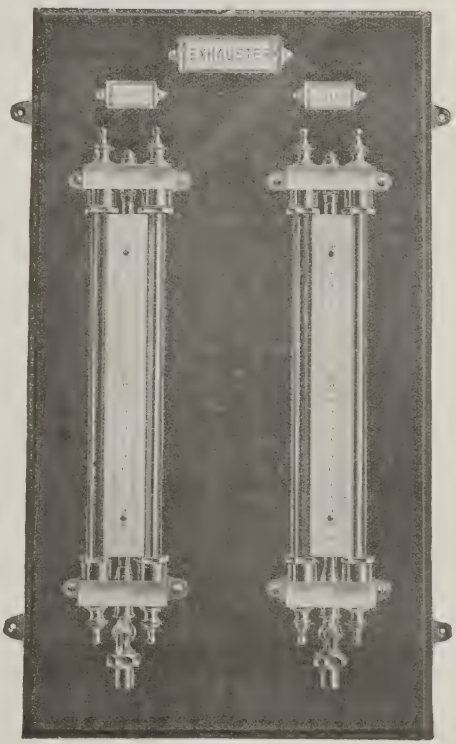

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STOCK MARKET REPORT.

THE weakness of gilt-edged stocks was the feature of the week on the Stock Exchange, for which various reasons have been assigned. The failure of the recent new issues and the possibility of a new conversion scheme being attempted are the principal of these reasons; but the fact remains that there have been many large sellers, and the absence of compensating buyers has resulted in a general depreciation all round. The outlook is not improved by the knowledge that other important loans will appear on the market at an early date. There is a silver lining to every cloud, and there were a number of purchases by trustees of stocks that are rarely available.

There is nothing of note to report in the other principal markets. Foreign Government and Foreign and Home Rails were all quiet. Industrials were colourless except the popular issues. Tobaccos, Real and Artificial Silks all improved. Courtaulds rose above the £5 mark. Imperial Tobacco, Dunlops, and Allied Newspapers all showed increases on the week. Electric issues have obtained a good deal of advertisement of late by reason of the various grandiose schemes that are being promulgated. The dividends have been gradually improving, but consideration should be given to the heavy capital expenditure that is being incurred.

Transactions in the Gas Market were less than usual, and the changes in the quotations were unimportant. The Imperial Continental ordinary is gradually losing the inflated value that arose out of the special distribution. The present average price—14½—on an estimated permanent return of 10 p.ct. would yield 6·66 p.ct.

An issue is announced of £8000 6½ p.ct. Irredeemable Preference Stock at a minimum of par by the Wells Gas Light Company.

The following transactions were recorded during the week:

On Tuesday, Alliance and Dublin 63, Commercial 3 p.ct. debenture 57½, Continental Union 34, European 6⅞, 7, Gas Light and Coke 83⅜, 83⅜, 84⅛, 4 p.ct. preference 79, 79½, Hastings and St. Leonards 3½ p.ct. 75⅝, Imperial Continental 148, 150, 151, 153 *ex* div., Montevideo 68, Primitiva 9s. 10½d., 10s., South Suburban 5 p.ct. 95, Tottenham "B" 95.

On Wednesday, Gas Light and Coke 83½, 83⅜, 84, 84⅛, 84⅜, 4 p.ct. preference 79½, Imperial Continental 147, 147½, 149 *ex* div., Montevideo 67, 68, 68½, Primitiva 10s. 1¼d., South Metropolitan 93⅜, 94¼, Tottenham "B" 95, 5½ p.ct. preference 104¼, 104½, Wandsworth 130, "B" 110, Epsom stock 112. Supplementary prices, Colonial Gas Association 7 p.ct. preference 18s. 6d., Gravesend and Milton 65.

On Thursday, Alliance and Dublin 65, Bombay 97s. 6d., British 111, Gas Light and Coke 83⅜, 83⅜, 84, 84¼, 3½ p.ct. maximum 62⅜, 4 p.ct. preference 79, Imperial Continental 147½, 148, 148½, 148⅜, 149 *ex* div., Montevideo 68½, 68¾, Primitiva 9s. 9d., 9s. 10½d., 10s. 3d., South Metropolitan 93⅜, 93⅜, 94, 94¼, 6⅜ p.ct. debenture 103½, Wandsworth "A" 130, "B" 110, 5 p.ct. Epsom stock 112.

On Friday, Bournemouth 6 p.ct. preference 11⅛, 11⅜, Brentford "A" 96⅞, Brighton and Hove original 167, Continental Union 33⅛, European 6⅞, Gas Light and Coke 83¼, 83⅜, 83⅜, 84, 3½ p.ct. maximum 62½, Imperial Continental 149 *ex* div., Primitiva 9s. 9d., 10s., South Metropolitan 93⅜, 6½ p.ct. debenture 103⅞, South Suburban 5 p.ct. 96, Southampton 5 p.ct. 80½, 80⅜. Supplementary prices, British, Norwich 3½ p.ct. mortgage debentures 62, 62½, Reading 5 p.ct. 82, 82½, Redhill "B" 82, 82½, Southgate and District 5 p.ct. debenture 98⅛, 98½.

Money was perhaps easier in Lombard Street. Old day-to-day loans were renewed at 3⅜ p.ct. and declined later to 3½ p.ct. The Treasury Bills average rate rose again from the previous week's rate of £4 6s. 4·48d. to £4 7s. 6·62d. p.ct.

The continued weakness of the franc dominated the Foreign Exchange Market. With both Paris and New York selling, the value fell to 103.05 on Saturday, finishing about a franc less. Belgian francs suffered in consequence, and closed at 104.10. Italian lire were 122½ to the £. Sterling on New York was very steady. Business was done at 4.86⅛, but closed at 4.86.

Silver was affected by Chinese sales, and the price for cash fell to 31⅜d. per oz. Gold remained unchanged at 84s. 11½d. per oz.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on March 5. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3½ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. June 5.	Rise + or Fall − on Week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 5	5	5	Aldershot 5 p.c. max. C.	78–81	..	..
295,492	,,	,,	4	4	Do. 4 p.c. Pref.	71–76	..	..
1,551,868	,,	Apl. 2	6½	6½	Alliance & Dublin Ord.	65–70	..	63–65
374,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb.	63–68	..	..
300,000	5	May 7	8	8	Bombay, Ltd.	4⅞–5⅛	..	4⅞
170,000	10	Mar. 5	8½	8½	Bournemouth 5 p.c.	12–13	..	..
425,050	10	,,	7	7	Do. B 7 p.c..	12½–12⅞	..	..
150,000	10	,,	6	6	Do. Pref. 6 p.c..	11–12	..	11⅛–11⅜
50,000	Stk.	Jan. 8	3	3	Do. 3 p.c. Deb..	55–59	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb..	78–81	..	..
992,045	,,	Mar. 5	6⅛	6⅛	Brentford A Con.	94–100	..	96⅛
900,800	,,	,,	6⅜	6⅜	Do. B New	93–100	..	..
76,000	,,	,,	5	5	Do. 5 p.c. Pref.	95–98	..	..
306,690	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	76–81	..	..
181,337	,,	,,	6	6	Do. 6 p.c. Rich. Red. Deb.	100–105	..	..
214,740	,,	Mar. 5	11⅛	12⅛	Brighton & Hove Orig.	165–170	..	167
244,200	,,	,,	8½	9½	Do. A Ord.	122–125	..	..
1,287,500	,,	Feb. 19	5	5	Bristol 5 p.c. max.	96¼–97¼*a*	..	..
855,000	,,	Mar. 19	8	7	British Ord.	110–115	..	111
100,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref..	123–128	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	72–77	..	..
100,000	10	May 21	6	8	Cape Town, Ltd.	61–7½*	..	..
100,000	10	Apl. 23	4½	4½	Do. 4½ p.c. Pref..	6–7	..	..
150,000	Stk.	Dec. 18	4½	4½	Do. 4½ p.c. Deb..	71–76	..	..
626,860	,,	Feb. 19	6	6	Cardiff Con. Ord.	101–104	..	..
217,860	,,	Jan. 8	7¼	7¼	Do. 7¼ p.c. Red. Deb..	104–107	..	..
157,150	,,	Feb. 19	5	6¼	Chester 5 p.c. Ord.	89½–94½*b*	..	..
1,513,280	,,	Mar. 5	6	5/11/18	Commercial 4 p.c. Cap.	86–89	..	..
560,000	,,	,,	6	5⅞	Do. 3½ p.c. Cap.	86–89	..	..
475,000	,,	Dec. 18	3	3	Do. 3 p.c. Deb.	57–60	..	57⅛
800,000	,,	14 Jan. 15	—	—	Continental Union, Ltd.	35–40	..	34–35⅛
200,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref.	88–92	..	..
660,000	,,	Mar. 5	6½	6½	Croydon sliding scale	98–102	..	..
284,975	,,	,,	5	5	Do. max. div.	83–86	..	..
492,270	,,	Feb. 19	6	9	Derby Con.	110–112*c*	..	..
55,000	,,	Jan. 8	4	4	Do. Deb.	74–76*c*	..	..
1,050,180	1	Jan. 22	6	4	European, Ltd.	6½–7½	–⅛	6⅞–7
16,460,070	Stk	Feb. 19	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	83–85	..	83⅜–84⅜
2,600,000	,,	,,	3¼	3¼	Do. 3¼ p.c. max.	62–65	..	62⅛–62⅜
4,062,235	,,	,,	4	4	Do. 4 p.c. Con. Pref.	78–80	..	79 79⅛
4,761,930	,,	Dec. 18	3	3	Do. 3 p.c. Con. Deb.	59–62	..	..
130,000	,,	—	10	10	Do. 10 p.c. Bonds	..	..	..
42,000	,,	,,	7½	7½	Do. 7½ p.c. Red. Deb.	..	..	..
82,500	,,	Mar. 19	6½	6½	Hastings & St. L. 5 p.c. Conv.	92–97	..	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	73–78	..	74½
70,000	10	May 7	10	10	Hongkong & China, Ltd.	15⅝–16⅛	..	..
86,600	Stk.	Mar. 5	10	10	Hornsey 7 p.c.	136–141	..	..
1,976,000	,,	May 21	10	59	Imperial Continental Gas.	147–152*	–3	147–153
263,050	,,	Feb. 5	3¼	3¼	Do. 3½ p.c. Red. Deb.	71–74	..	..
235,242	,,	Mar. 19	6½	6½	Lea Bridge 5 p.c. Ord..	96–101	..	..
4,127,340	,,	Feb. 19	5½	5½	Liverpool 5 p.c. Red.	88⅜–89⅛	..	89
600,000	,,	Mar. 19	7	7	Do. 7 p.c. Red. Pref.	103⅜–104⅜*b*	..	..
165,736	,,	Feb. 19	9	8	Maidstone 5 p.c. Sup.	122–132	..	..
63,480	,,	Dec. 18	3	3	Do. 3 p.c. Deb..	53–58	..	..
75,000	5	Dec. 4	7	5	Malta & Mediterranean	4½–4¾	..	..
541,920	Stk.	Nov. 20	4	4	Montevideo, Ltd.	66–70	..	67–68⅛
2,061,315	,,	Mar. 5	5	5	Newcastle & Gateshead Con.	75–77*d*	–1⅛	..
300,929	,,	,,	4	4	Do. 4 p.c. Pref.	76–77*d*	..	..
529,705	,,	Dec. 18	3¼	3¼	Do. 3¼ p.c. Deb.	68¼–69¼*d*	..	..
15,000	,,	Mar. 5	11	12	North Middlesex 10 p.c.	..	..	..
75,940	,,	,,	7⅞	8⅛	Do. 7 p.c.	..	..	..
300,000	Stk.	May 7	9	7	Oriental, Ltd.	100–105	..	..
188,120	,,	Mar. 5	7⅛	7⅛	Plymouth & Stonehouse 5 p.c.	109–114	..	..
60,000	50	Mar. 5	13	14	Portsea Island B	96–99	..	..
100,000	50	,,	12	13	Do. C	93–98	..	..
2,289,909	1	—	—	—	Primitiva Ord.	9/6–10/6	..	9/9–10 3
311,100	100	June 2	4	4	Do. 4 p.c. Red. Deb..	78–80*	–1	..
600,000	Stk.	Jan. 22	4	4	Do. 4 p.c. Red. Deb. 1921	64–66	..	..
220,335	,,	Dec. 18	4	4	Do. B. Aires 4 p.c. Rd. Db.	65–67	..	..
321,670	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	65–67	..	..
150,000	10	Mar. 19	6	6	San Paulo 6 p.c. Pref.	7⅞–8⅛	..	..
125,000	50	Jan. 2	5	5	Do. 5 p.c. Red. Deb.	43–46	..	..
270,000	Stk.	Mar. 19	5½	5½	Sheffield A	103–105*e*	..	..
419,968	,,	,,	5½	5½	Do. B	103–105*e*	..	..
1,047,000	,,	,,	5½	5½	Do. C	103–105*e*	..	..
90,000	10	Oct. 23	8	6	South African	7–9	..	..
6,609,895	Stk.	Feb 19	5	6½	South Met. Ord.	93–95	..	93⅛–94⅛
1,895,445	,,	Jan. 8	3	3	Do. 3 p.c. Deb.	59–62	..	..
734,000	,,	Mar. 5	6½	6½	Do. 6½ p.c. Red.Deb.	102½–104½	..	103⅜–103⅝
91,500	,,	Mar. 5	8½	8½	South Shields Con.	135–136*d*	..	..
1,787,795	,,	Feb. 19	6½	6½	South Suburban Ord. 5 p.c.	95–98	..	95–96
368,837	,,	Dec. 18	5	5	Do. 5 p.c. Deb.	97–100	..	..
647,740	,,	May 7	5	5	South'mpt'n Ord. 5 p.c. max.	80–83	–1	80⅛–80⅜
121,275	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	72–77	..	..
250,000	,,	Mar. 5	7	7	Swansea 7 p.c. Red. Pref.	102–104	..	..
200,000	,,	Dec. 18	6½	6½	Do. 6½ p.c. Red. Deb.	103–105	..	..
120,000	,,	Feb. 19	8	8	Tottenham District A 5 p.c.	116–119	..	..
882,275	,,	,,	6½	6½	Do. B 3½ p.c.	95–98	..	95
150,000	,,	—	—	—	Do. 5½ p.c. Pref.	103–105	..	104⅛–104½
181,255	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	77–80	..	..
258,251	,,	Mar. 19	5	5	Tynemouth Con. and New	74–76*d*	..	..
197,294	,,	Feb. 19	6⅞	6⅞	Uxbridge, Maidenhead, & Wycombe 5 p.c..	95– 00	..	..
88,130	,,	,,	5	5	Do. 5 p.c. pref.	95–100	..	..
91,800	,,	,,	—	6⅞	Do. 5 p.c. Maidenh'd	90–95	..	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Mar. 5	9½	9½	Wandsworth A 5 p.c.	130–135	..	130
255,636	,,	,,	7½	7½	Do. B 3½ p.c.t.	110–115	..	110
392,955	,,	,,	6/9/6	6/9/6	Do. C and New	95–100	..	..
352,000	,,	,,	7⅛	7⅛	Wimbledon 5 p.ct.	105–110	..	..
98,000	,,	,,	7⅛	7⅛	Epsom 5 p.ct..	112–117	..	112
88,416	,,	Dec. 18	3	3	3 p.c. Deb.	57–60	..	..

Quotations at:—*a*,—Bristol. *b*,—Liverpool. *c*,—Nottingham. *d*,—Newcastle. *e*,—Sheffield. * Ex. div.

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VOL. CLXX., No. 3240.] WEDNESDAY, JUNE 17, 1925. [77TH YEAR.

EDITORIAL NOTES.

The Institution Meeting.

As we glance over the doings of last week, at the annual meeting of the Institution and in conjunction with it, it must first be said that it was a brilliant success. Such a success is not due to a single feature, but to many—ranging from presidential energy and admirable direction, numerical representation, sustained interest through the quality and current appropriateness of the topics before the members, to the attendant attractions, and the contribution of exquisite weather. Those who were participants found all these traits; and the mainspring throughout was the President (Mr. J. Ferguson Bell, M.Inst.C.E.), whose zeal in seeking to maintain the best traditions of his office and his loyalty to the interests of the industry so attracted the attentions of Old Sol that his enthusiasm was almost unbounded. Everybody concerned in the meeting is grateful to the President and his great luminous ally. It was a happy and profitable week, with no blank spaces in it. It brought home to us the great expanse of the interests of the industry, of the universality of its work, and of how through efficient organization we are causing other people to become more and more interested in our affairs. This last-mentioned aspect shows a trend in the right direction; and every means and opportunity should be taken to cultivate it. The industry has been all too content to live and to serve and have no associates beyond its own boundaries. This is a mistake; the present proves it with influences at work in high places which are not to the advantage of the industry. But the mending or changing of this deficiency is now in process of development; and our claims and far-reaching importance in the system of affairs and service are becoming better known. There is much to be done and to be maintained in this direction. Fortunately the industry is in the guiding hands of those who fully realize this, and are working to make new friendships where they are wanted—not for the purpose of gaining any undue consideration, but to ensure that knowledge of us is what it should be. At the meeting last week, there were men from the political world. On one occasion the President and Council of the Institution had the pleasure of entertaining one of His Majesty's Ministers (the President of the Board of Trade), and an ex-Minister and leader in the Labour Party (the Right Hon. J. H. Thomas), while at another stage in the proceedings the Right Hon. Sir Alfred Mond, Bart., addressed the members. This is as things should be. We want, too, to encourage inter-relationships abroad. We have both technical and commercial interests to serve; and a better knowledge of us by our friends and by us of our friends and of each other's work and advances will be mutually helpful. On this occasion members of the profession from the Continent and from far overseas came to, and took part in, the meeting. The President of the Société Technique du Gaz, through M. Baril, contributed an item of large interest on the subject of tankless gasholders, which, with the discussion, has assisted considerably in clearing away or thinning down doubts regarding these structures.

In the succeeding article, comment is made upon the Presidential Address, and preceding the General Report there is a review of the entire proceedings. There are certain of the reports and papers upon which comment may be deferred. The members were gratified with the excellent report made by the Education Scheme Committee, which was presented by Mr. F. W. Goodenough. For such an innovation as this scheme, it shows excellent progress, considering these are early days in its career. It is making history, because what is being done is going to be of untold advantage to the industry in equipping it with men specially trained for its service and responsibilities. Good work has been done for a number of years by the Gas Investigation Committee, through the researches carried out under the direction and supervision of Prof. Cobb at the Leeds University; but the past year has been largely occupied in preliminary work on the Corbet-Woodall memorial experimental plant, which we confidently predict is going to be invaluable in increasing the scope of research. The Gas Investigation Committee would, Mr. Thomas Glover says, be pleased to receive for consideration suggestions as to work which should be taken in hand. One is a thorough research into coke production. We can think of no line of investigation which would be at the present time of greater service to the industry; and the sooner it is taken in hand the better. From the references to coke in one of the reports, we think that Prof. Cobb and his staff have this in mind. There is much need for precise information as to the physical qualities of coke which, without sacrificing our high temperatures in carbonization, will give good ignition and combustible virtues to the product. Having obtained this information, the industry requires to know the blends of coal and other conditions which will best yield such coke. There is also the questions of mixing a proportion of coke with coal charges, and the definite ascertaining of the effect this would have upon the transmission of heat through a charge, upon the throughput and productivity per retort, and upon the ability to use lower temperatures with advantage to the life of the refractory materials of which retorts and settings are composed. There is a connection here between the hoped-for investigation at Leeds and the Joint Refractories Research Committee's work. As Sir Arthur Duckham said, if we can get a carbonizing plant to have a longer life, the costs of carbonizing will be reduced considerably; and this will materially affect the net cost of gas. The Wrought-Iron Tubing Committee, under the chairmanship of Mr. Albert Stokes, have quickly got well into their work; and it is easy to predict a valuable result in the shape of a specification and test. The engineering and other papers—to which reference will be made as opportunity permits—by Sir Dugald Clerk, Prof. C. V. Boys, Mr. W. M. Carr, and Mr. George Evetts were in several respects of first-class importance.

Hearty congratulations and good wishes are offered to the new President (Mr. C. F. Botley, of Hastings), and to Mr. John Wilkinson and Mr. H. D. Madden upon their advancement along the road to the Chair of the Institution. The great enjoyment which the President and Mrs. Bell gave the members on Tuesday night will long be remembered. The intellectual treats provided for the members by the Gas Light and Coke Company, the South Metropolitan Gas Company, and the National Physical Laboratory were highly appreciated. And as to the excursion on Friday, it was the happiness of the Chairman (Mr.

W. Woolley) and his colleagues of the Derby Gas Company to know how fitly it crowned and finished a glorious week. Never has there been an Institution meeting which has exceeded, though some have equalled, the success of this one. During it, the interests of the industry have been distinctly advanced.

The President on Our Opportunities and Requisite Work.

PERSPICACITY and lucid statement were characteristics of the Presidential Address; and there was a continuity of thought through it which carried us from basic facts as to the position and importance of the industry in the work and economics of the times on to our duty in making the maximum use of our potentialities by insistent, persevering research and by the application of the findings as we proceed, and as opportunity serves. There is good ground for such counsel. We realize that there is a strong movement which if successful would—providing the expectations were fulfilled—place in the hands of our competitors advantages which it is not proposed to confer upon the gas industry; and, truth to tell, we would rather be without them. But that movement should be a blessing in disguise in urging us to do everything possible to strengthen our hands for the more acute competition which threatens. For our own part (while doing all possible to further resistance to the proposals of the Government in regard to the electricity supply industry as being unjust if national money is used for helping one competing industry as against another, and as showing no national advantage—indeed, the reverse in respect of the utilization of our coal resources), we have confidence that the gas industry possesses such vitality and possibilities if developed with set purpose that the situation in those spheres in which gas supply has proved advantages will be, so far as electricity supply is concerned, considerably worsened. That confidence is reinforced by the address of Mr. Bell, which shows conclusively that, if the Government are going to render financial assistance to the electricity industry, they are not only backing the wrong horse, but they are doing something that is wrong nationally and in principle.

The address shows, as does every part of the proceedings at the annual meeting, the largely increased strength of the industry through the developments of recent years. Those developments have given us new foundations. The problems of to-day are far greater than those of yesterday; and each development produces fresh problems. Right in the forefront of the address, the President solicits the continued enthusiastic activity of members in promoting the advancement of the industry by applying themselves to the solution of the many problems on which success depends. In other words, what he urges us to do is to use our existing strength, and leave nothing undone, in the way of research and education, to develop the industry's resources so that we may maintain our supremacy, despite any political errors that may be made. We place on equal planes both research and the education of men for the industry. The two are united and interactive; and, holding that view, we welcome the foreshadowing in the address of the probability that membership of the Institution will in the near future be by examination. If that comes to pass, knowledge being the dominant essential for membership, we see no reason why there should be any limitations of an official order placed upon membership, though in the first stages, at any rate, we do see reasons for examinations being graded in respect of men managing works of the lower magnitude. It is the expansion of our industry, its services, and the enlargement of our outlook, together with the more active competition through the development of the resources of our competitors, which makes more forceful the constant reminder of the need and importance of research and adequate and specialized educational training.

The President gives statistics showing the progress of gas supply in this country and America. The comparison which this affords is extremely interesting. Our progress in this country, with an investigation of the lines along which it has been made, is directive as to the future. We have reached a consumption of gas in statutory supply areas, taking the latest available data, of 282 thousand million cubic feet a year, with about 8½ million consumers. But in America (despite the constant references of our electrical friends to the wonderful accomplishments of electricity in the States), they had in 1923 a consumption of 370 thousand million c.ft. of manufactured gas, and 760 thousand million c.ft. of natural gas (together 1130 thousand million c.ft.) with 9½ million consumers—that is to say, only a million consumers more than we had, but a consumption which dwarfs ours completely. And in view of the higher calorific values of manufactured gas in the States and the high calorific value of the natural gas, the thermal disparity is much greater. In America, as here, large strides are being made in the applications of gas for domestic heating apparatus, cookers, water heating, and gas-fires; but it is to industrial work that a large proportion of the huge consumption of both manufactured and natural gas is applied. The availability of natural gas in the States taught industry there the value of gaseous heating; and now that there is a dwindling of the yields of that gas, the manufacturers are anxiously looking round for ways and means of producing not only the necessary compensation, but more gas. And the prospect is that it will be done by the gasification at the collieries of low-grade fuel, with transmission through the natural gas systems—perhaps at first in conjunction with the natural brand. The fact that the natural gas is giving out in some districts indicates what will happen in others; and we therefore look for a prodigious increase in manufactured gas in the States for industrial purposes. In this country we have not had the advantage of natural gas supplying thermal energy at low prices; and the education of our manufacturers as to the advantages of furnace heating, steam raising, and other processes by gas has consequently been a slower process. Now the British Commercial Gas Association have on record a list of more than 4000 trades in which gas is used with an average of seven processes in each. This, as the President says, indicates the immense field there is for future development and enterprise. Within its limits, Derby illustrates what a studied consideration of the industrial business can achieve; but we are bound to say that Mr. Bell, pleased as he must be with what has been accomplished there, will not be satisfied until a still greater proportion of the growing output is for industrial purposes. In the past decade there has been an increase in the industrial load at Derby of 128 p.ct.; the total industrial consumption last year being 326 million c.ft., or 21 p.ct. of the total output. There gas-engines have for over twenty years been fixed on hire-purchase terms, and now the progressive Board have decided to let them out on simple hire. We admire the enterprise and the results.

The fact of the matter is that the gas industry in this country, proud as it is of its achievements, is only just awaking to its great potentialities; and thus it is that energy has to be directed to ascertain how best to meet the requirements that have opened up before us—domestic and industrial. When we survey, as the President leads us to do, the enormous field there is in domestic heating in several directions, and the untold scope there is in industry for our primary commodity, there is satisfaction. But satisfaction alone will not help along the development which will suppress the waste that is going on to-day through the immolation on the altar of crudeness of a vast tonnage of coal annually—representing a loss, the President calculates, of £30,000,000 a year— nor will it without work in other directions teach the manufacturer the economic advantages of gas heating through the employment of such a flexible and tractable fuel as gas. As the President shows, electricity cannot offer such value for money as gas for any ordinary heating purpose. The efficiencies he gives for gas are easily upheld in daily practice; and our electrical friends cannot dispute the fairness of those he supplies for electricity, for the simple reason that they are determinations from actual tests. Then, further, the industry has the liberty conferred by the Gas Regulation Act of adopting the most economic calorific value for gas in relation to local circumstances. That liberty we must not forego, because we do not know what the future has in store. On that point, the President thinks there is much to be said for a uniform calorific standard of (say) 500 B.Th.U. for the whole country.

That is a view—we think the only one in the address—in which we disagree with the President. We do not think a universal calorific value would do much to reduce manufacturers' costs, seeing that the difference between one calorific value and another (within the limits of practice to-day), taking into account too the difference of pressure and specific gravity, is more a matter of adjustment than of structural variation. It is true that 500 B.Th.U. would simplify the work of the clerical department, and enable consumers readily to convert volume into therms. It is true too that there has been a marked tendency on current economic grounds to return from lower declared values to 500 B.Th.U. or something approaching. But do not let us talk of what would be the reactionary step of restoring uniform value. In view of the unknown future, the flexibility gained by the Act must be maintained; and the address supplies other reasons why it should be, and why gas making in this country should not be again stereotyped. The President gives representative thermal efficiencies for the various gas-making systems; but he himself points out that those efficiencies are subject to the variations that availability of different grades of coal brings about, and which necessitates the placing of economic efficiency as shown by the net cost per therm into the holder before the thermal efficiency of the process, important as this is in securing the maximum result from the process in the circumstances of its use. There we have a reason, even in current conditions, against returning to a uniform calorific value throughout the country. Our processes, too, may undergo considerable changes before long, by, for example, altering the characteristics of retort charges to secure more rapid heat transmission, and better physical qualities in coke. That may hasten the adoption of internal heating and the displacement of current practices. The President says we are on the eve of great developments in the utilization of gas; and it is fortunate to be able to believe that we have not reached the end of important developments in our carbonizing operations. Moreover—and the President makes a strong point of this—investigations in America with natural gas of 1100 B.Th.U. per c.ft. and manufactured gas of from 725 to 500 B.Th.U., and the work of the Research Committee of the Institution and the Leeds University with gas between 500 and 240 B.Th.U., "indicate that the relative usefulness of various gases for ordinary purposes is directly proportional to their heating value, and that there is no advantage in gas of the lower heating values, but rather the reverse for gases of low calorific value with high inert content." The opposite lesson is also indicated—that there is no advantage (other than in the volume of gas to be distributed) in the higher heating values compared with the lower ones, provided the inert content is not abnormal, and there is consistency in the gas and conditions of supply. On all material points the evidence shows the wisdom of not giving up, by voluntarily returning to uniformity of calorific value throughout the country, the liberty conferred upon the industry by the Act. Under it every individual who agrees with a 500 B.Th.U. standard in his current circumstances can adopt it.

However, this all shows that the address points to the immense scope for service that lies before the industry; it indicates the directions of greatest possible development; there is the liberty conferred by the Gas Regulation Act; there is the important fact that we can through that liberty alter our practices to suit changing and uncontrollable economic conditions; and there is the fact that in use the efficiencies of gases of different calorific values are approximately the same. In those conditions there is plenty of inducement and encouragement to search and to work for still greater progress in our manufacturing systems. At the moment we appear to have got to a point where the over-all efficiencies of various processes do not show any notable variation; and though some processes give more gas and less residual products than others, the net cost per therm into the holder (combined with other considerations) has not been sufficiently seductive to induce gas engineers to make those systems their main sources of supply, but, save in restricted circumstances, they have continued to occupy the positions of auxiliaries. While talking of this matter, we must congratulate the President regarding his statement as to net cost of gas last year into the holders at the Litchurch Works of the Derby Gas Company. Carbonizing cheaper coals and smalls, the over-all thermal efficiency was for a mixed gas 70·86 p.ct.; and the average cost for coal, coke, and oil was 4·48d., and less residuals 3·34d., or 1·14d. net per therm for a gas of 503·8 B.Th.U. The oil used was only 0·0428 gallon per 1000 c.ft. to enable the use of larger percentages of C.W.G. to meet sudden increases in the demand. Of a total make of 1362⅛ million c.ft., 20·93 p.ct. was blue or slightly carburetted water gas. In this connection, the President emphasizes the invaluable aid that the auxiliary types of plant are to the gas manufacturer, both in promoting as occasion demands better economic conditions, and in meeting peak loads or needs in times of emergency.

This brings us back to the insistent note which we find in the address as to utilizing in every possible way the services of research, to point the directions in which we can, with still better effect, enter into the vast open territories that lie before the industry. Research is the most direct course to development. The President, as an old gas practitioner, knows it; and he cannot give too much praise to the work that has been done by the Research Committee of the Institution and the Leeds University, and by the Fuel Research Board. They have supplied knowledge which has removed defects, and pointed the ways to a greater certainty of result. They have also shown present limitations, and the advantages to progress that we possess in the efficiencies of utilization of our heating product. We have reached a state of knowledge at which it may be said that with present plant and materials we are getting approximately maximum results where there is careful supervision and control. Let us, however, regard that in looking to the future as all fundamental. What is there beyond? Research and time alone can inform us. It is to that the Presidential Address leads us. And if we merely direct the attention of readers to the sapient views of Mr. Bell on the subject of working to enlarge the field of coke utilization, and to his protest against Government assistance to the electricity industry, and his plea for an inquiry covering a larger field than electrical power, it is because the matters already dealt with provide the main theme in an address which gives us abundant reason for pushing forward in the attempt to gain more and more strength and power for meeting the demands that lie before.

Bitumen and Electricity.

NATURALLY, with a large assembly in London last week of those chiefly executively responsible for the technical and commercial interests of the gas industry, a great deal has been heard of the matters upon which the industry is in unison acting on the defensive. The present position is that the use of gas is increasing in volume, especially for domestic heating and industrial purposes. The Government, on the other hand, are proposing to "assist" the electricity industry to co-ordinate its generating procedure and to expand its means of distribution. Why the Government should do this, and not leave it to the industry itself, is not at all clear, either on rational or national grounds. The secondary products of coal carbonization have suffered a set-back; and yet Sir Henry Maybury, who began the ride to his present distinguished position over tar-surfaced roads, is now—according to newspaper reports—decrying his best friend tar for the purpose of road work, and advocating imported bitumen in preference to the home-produced material. Many people who know fully the long history and the acclaimed and acknowledged advantages of tar for road purposes, originally demonstrated on the roads of Kent when Sir Henry had charge of them, are asking why there is this change of front; and they are getting inquisitive. Coke, also, is not yielding as it should do; and among a combination of several causes which has produced the set-back, is the one that the coke-oven industry is increasing its energies in producing coke suitable for purposes for which gas coke is employed. There is sulphate of ammonia, too, which has now to meet the condition of increased output through the enormous supplement of

synthetic nitrogen. But the new competition that has to be faced by the two latter secondary products is of an order which must be combatted by the exercise of ingenuity and energy within the gas industry itself. In regard to coke, we have the advantages of local situation and better distribution facilities than the coke-oven people; and it is a question of adding to that a proper preparation of coke and improving the quality as far as possible, with the view of making it not only as acceptable, but preferable in the region of its production.

The questions of tar and bitumen and electricity are altogether different ones. It is not a matter of improvement in the quality of our products or trading methods; it is, to put it bluntly, a question of dealing with influences in high places. Last week there was much private discussion among gas men as to the lately developed advocacy of bitumen in place of prepared tar for road work; and the matter is not going to be allowed to rest where it is. The Government are busy, under the Safeguarding of Industries Act, protecting various industries. Some of the Labour members—strong anti-protectionists that they are according to party creed—are beginning to talk of the productions of our own workers being favoured instead of those of foreign workshops. Twenty of them voted for Imperial Preference last Friday; and there would have been more had they been in the House at the time. However, as to safeguarding our own industries and productions, there is great unemployment in the land; and our politicians are seeking ways of realizing relief from the financial burden and loss that this entails. The miners are seeking to improve their conditions. Tar is a commodity produced from coal in British works, by British workmen, plant, and capital; bitumen is an imported article. If he is reported correctly, Sir Henry Maybury is turning his back on British tar for British roads, and is recommending bitumen. It would be of interest to know whether there is any misunderstanding. In the presence of the President of the Board of Trade (Sir Philip Cunliffe-Lister), at a luncheon last week, Mr. D. Milne Watson stated that Sir Henry was reported to have said that tar would stick to anything except the road. To say this of a British product, and to attempt to persuade people to use imported bitumen for road-making purposes, Mr. Milne Watson emphatically described as a "scandal." If Sir Henry has not been misreported, then he has to explain to people who years ago admired and appreciated the roads of Kent, why it is that the tar stuck to the roads very well then, and why the Mr. Maybury of those days issued many laudatory reports concerning its advantages to the users of roads and its preservative qualities which were of benefit to those responsible for the upkeep of the surfaces—reports and papers such as the one before the International Roads Congress in Paris in 1908. [See "JOURNAL" for Oct. 27, 1908, p. 266.] The President of the Board of Trade knows the roads of Kent, and so do thousands of other people; and at the luncheon referred to, he put the question as to whether it is not a fact that the roads of Kent, which in past years set the standard for road construction throughout the country, did not obtain their pre-eminence by the use of tar, and not of bitumen. The reply came from Dr. Charles Carpenter that, when Sir Henry Maybury was an official of the county authority, and was responsible for the Kentish road system, tar was used as the surfacing material, and the roads were a model which should have been generally followed. Thousands upon thousands of the users of those roads can give similar testimony; and therefore it is fair to ask, Why this *volte-face* on the part of Sir Henry, who was the pioneer in this work? That is a question which sooner or later must be answered, as well as the one which will be put by those people who are disinterested in the materials used, but who are well acquainted with the roads of Kent and other counties, as to why years of good experience with tar have come to an end with the exploitation of imported bitumen for the same purpose. If it is a question of fisheries, then the roads alongside such rivers and streams are of comparatively short length compared with the enormous aggregate length of other roads; and tar can now be prepared (as the South Metropolitan Company are demonstrating at Wembley) so that washings from it are perfectly innocuous. There will be general agreement with Sir Philip Cunliffe-Lister that, having regard to the general state of trade, and the fact that industry is working on a diminishing margin of profit, it is of vital importance that use should be made for home requirements of commodities made in this country rather than of imported materials—due regard being had to the national interests involved. In the employment of any product of coal, Sir Philip also remarked, home industry is helped, and more money is provided to found new markets. What was actually said on the subject at the luncheon will be found reported elsewhere.

Tar and bitumen, however, were not the only topics privately and publicly discussed during the week. There were the Government's proposals as to electricity. On the opening day of the meeting, there was a deputation to the Ministry of Transport (headed by Mr. D. Milne Watson) representative of practically the whole of the company and municipal gas undertakings of the United Kingdom. The case of the gas industry as to the proposals was laid before Colonel Ashley, Sir Burton Chadwick, and Colonel Moore-Brabazon; and Colonel Ashley undertook to bear in mind the representations made to him, and to see that they had due consideration. If "due consideration" is given to them, the Government must see that there is no need for their intervention in the national interests; that any financial assistance to the electricity industry is unnecessary, and would, in any case, be unfair to a competing industry, which has developed itself by its own exertions and from its own resources; and that the problem in hand is one which should receive investigation from the source of power and heat—coal—in order that the error should not be made of giving Government support to any project which would mean a wasteful utilization of our principal natural and national asset. In his address at the meeting of the Institution, the President also made out a strong case against Government assistance to the electricity industry. The matter was again raised by Mr. Milne Watson at the luncheon at which Sir Philip Cunliffe-Lister was present. Sir Philip urged that the gas industry should not spoil their case by placing their claims too high, and suggested that, if there was some particular way in connection with an industry in which the Government could assist to bring about better conditions in the national interests, it was a matter for their consideration. We know that the Board of Trade have deeply at heart the interests of the gas industry. There is no question about that; but no one in the industry desires that the Board should make any move for preferential treatment to it, beyond enabling it, through its own resources, to provide the best possible public service. But we do submit, with all deference to Sir Philip, that it is not the gas industry that is placing claims too high, but (we judge from speeches by Ministers and statements in Parliament) it is the Government who are doing so through misconceptions and mistakes due to the want of fundamental, elementary, and comparative knowledge of this particular subject. The inquiries of successive Governments into this matter have been, *ab initio*, too narrow to place them in possession of that fundamental, elementary, and comparative knowledge which would have enabled them to arrive at right conclusions. There are men in the electricity supply industry who do not want Government assistance or interference; there are others who are laughing up their sleeves at the prospect of the Government—in sheer innocence—supplying "assistance" from the national funds to help to build-up an industry which is already enjoying a considerable measure of prosperity. If there is anything in the proposals of the Government which competent electrical men consider would be of advantage, does the Government think that, without having recourse to the moneys of the taxpayers, the electricity industry would not find ways and means of adopting them? The industry is not in an indigent condition. The truth lies in the contrary direction. If the Government require more evidence, it is at hand; and, in seeking it, the addresses which Mr. Milne Watson has recently delivered will be considerable enlightening aids.

The gas industry cannot afford to sit still while such questions as those to which we have referred are developing. It would be of little use to raise a protesting voice

after the mischief had been done. The members of the Government could properly say: "Why did you not speak before?" and they would be justified in ignoring an industry which had allowed things to proceed without taking defensive action. In both the matters of bitumen and electricity, the gas industry is fighting not only in its own interests, but in those of the nation. That it is doing so can be proved up to the hilt; and, if that is true (and we know it is), then the industry is not placing its claims any too high.

Chemical Manufacturers and the Gas Industry.

The chemical manufacturers have, through Mr. J. L. Deuchar, the Secretary of the Castner-Kellner Alkali Company, Ltd., pursued the Gas Light and Coke Company through the Courts right to the House of Lords, in connection with their manufacture of caustic soda for converting naphthalene into beta naphthol. The importance which the chemical manufacturers attached to the case is attested by their action in taking it to the House of Lords. The fact that in every Court the Gas Light and Coke Company won, is significant of the strength of their right. We congratulate them on the result of a case which was a deliberate attempt on the part of the chemical manufacturers further to control the liberties of the gas industry. In the dismissal of the appeal, the Lord Chancellor, and Lords Dunedin, Atkinson, Sumner, and Buckmaster were unanimous. The chemical manufacturers have—at a price—gained the knowledge that they cannot be permitted to rule the economies of another industry.

Gas Prohibition by Local Authorities.

We are pleased to note that a point we have previously raised—on a recent occasion in connection with the Newport (Mon.) Corporation Bill (*ante*, pp. 444, 719)—has also been receiving the attention of the National Gas Council. It is becoming a common practice for local authorities possessing electricity undertakings to insert in tenancy agreements, in respect of houses built by them as representing the ratepayers, a condition to the effect that gas shall not be used for specific purposes. The question has been discussed by the "N.G.C." as to the position that would arise should a tenant apply for a supply of gas, as he or she is entitled to do under the Gas Acts. Gas suppliers have no power to refuse, seeing that the law stands above conditions inserted in tenancy agreements by a municipal authority. Not long ago a local authority was prevented from supplying electricity to a house which had been wired by non-union labour, by a threat that, if they did so, the trade union employees at the generating station would be called out. An action by the tenant against the local authority resulted in a decision that they were bound to supply under the General Act. The "N.G.C." considers that the matter is of such importance to the whole industry that Counsel's opinion should be taken. It will be interesting to see the result.

The Coke Competition.

Papers for this world-wide competition are beginning to arrive. There is now less than a fortnight before the competition will close. Careful attention should be given by competitors to the conditions as to name and address being enclosed in a sealed envelope bearing outside the *nom de plume* which appears on the paper. Those contributors who are competing in different sections should send the contributions in separate envelopes. These requirements, with several others, were plainly set forth in the issue of the "JOURNAL" for Feb. 18.

At Wembley.

With so many gas engineers and their wives in London last week, although there was no set visit, many of them found their way to Wembley, and inspected the Gas Exhibit and what is being done near by to develop the interests of coke and tar. Those who mentioned to us their visits expressed complete satisfaction with what they had seen.

How to Save the Coal Industry!

Low-Temperature Carbonisation, Ltd., have issued a little booklet giving extracts from speeches and writings from various non-technical sources eulogizing low-temperature carbonization for the production of oil, and included are figures from the Fuel Research Board's report on the results of tests made at the Barnsley plant. It is not stated in the booklet that the Board are not yet satisfied as to the commercial success of low-temperature carbonization, and that they are well aware the products would be exposed to violent market fluctuations. But information is supplied as to the large imports of oil, and regarding their enormous value. The prediction is made that at the present rate of increased consumption of oil, "England's greatest industry—the coal trade—on which the supremacy of Great Britain was built, approaches its doom." How terrible! The only solution of the problem, according to the booklet, is low-temperature carbonization. It seems to be taking the system a long time to make strides in its work of salvation for the coal industry. Mention is made of what is going to be done when that 1000-ton-a-day plant at Nottingham is at work. Not much has been heard about this plant lately. Has its construction been started yet? And has the Company obtained the capital for it? No doubt the coal industry will be gratified to learn that Low-Temperature Carbonisation, Ltd., is willing and waiting to save it.

Coal Mines Inquiry.

There have been further sittings of the Sub-Committee of coal owners' and miners' representatives to consider the causes of the depression in the industry, and to explore how economies in production can be effected. The matter is approaching a head; and to-day or to-morrow a very interesting stage will no doubt be reached, and probably further developments will take place next week. The miners' leaders we believe are wise enough to see that the remedies must be internal, for nothing of an external nature can convert the industry from its state of depression to prosperity. One of the main causes of the cloud overhanging the industry is that people abroad can buy coal at a cheaper rate from other countries, and the reason for the dearness of our coal is that the costs of production are too high. That is the position in a nutshell. No one wants the earning power of the miners to be reduced; but the solution of the trouble can only be a greater production for the money earned, so that the costs per ton will be lowered. Neither side has yet formulated proposals; but there are those among the miners' leaders who say they will not accept any suggestion as to a longer working day. Supposing there is no other solution, are the miners' leaders going to allow things to go from bad to worse?

"B.C.G.A." Annual Conference.

In order that those intending to be present may keep the dates open, Mr. J. C. Walker (the Secretary and Assistant Manager) notifies that the British Commercial Gas Association's Fourteenth Annual Conference and General Meeting will be held in Plymouth on Monday, Tuesday, and Wednesday, Oct. 19 to 21. As hotel accommodation in Plymouth is very limited, and as it is anticipated that there will be a large attendance of members, the earliest possible applications for rooms is advised.

Irish Association of Gas Managers.

An excellent programme is being arranged for this year's meeting of the Irish Association of Gas Managers, which, it has been learned from the energetic Hon. Secretary, Mr. George Airth, of Dundalk (who was in London last week attending the annual meeting of the Institution of Gas Engineers), is to be held in Belfast on September 15, 16, and 17. This is a month later than the date usually fixed; but it may be explained that it is to take place in conjunction with meetings of the Irish Section of the National Gas Council and of the "B.C.G.A." There is also, at the same time, to be a big gas exhibition in Belfast. A feature of the meeting (of which full particulars will be announced later) will be an excursion to Portrush and the Giant's Causeway.

The Bournemouth Group Photograph.—Copies of the large group photograph, taken on the occasion of the visit of the Southern Association to Bournemouth, can be obtained of the photographer—Mr. J. Reade, 58, Holdenhurst Road, Bournemouth. The price per copy, including postage, is 5s.

Correction in Southern Association Report.—We regret the incorporation of an error in our report of the Summer Meeting of the Association in Bournemouth. Mr. William Cash, at the luncheon, said—*not* as given by us at the end of his speech—that he was proud that the Engineers of the Barnet, Croydon, and Worthing undertakings, of which Companies he is also Chairman, were present.

PERSONAL.

The Burnley Gas Committee have recommended the appointment of Mr. W. H. Cooper, of Harrogate, to the position of Manager of the Corporation's gas showroom.

Mr. G. F. Horsley, an original member of the Institution of Chemical Engineers, has been appointed to the post of Director of Research for the Nitrate Producers' Association of Valparaiso. The Institution of Chemical Engineers have recently successfully started an Appointments Bureau; and it is hoped that all those who have appointments to fill will place particulars of them on the register of the Bureau at Abbey House, Westminster, S.W. 1.

OBITUARY.

Sir Wilson Mappin, Bart., J.P., of Thornbury, Sheffield, who died on Monday of last week, after a long illness, at the age of 77, was intimately connected with the Sheffield Gas Company for a long period. Elected a Director in 1885, in succession to Mr. Horace Walker, he became Deputy Chairman in 1891; and in 1908, when his father resigned the chairmanship, which he had held for 35½ years, Sir Wilson Mappin was chosen for the vacant office. He devoted a great deal of his time to the concerns of the Company—not only taking his part in the Directors' meetings, but being regular in his attendance at the offices, and diligent in acquiring a detailed knowledge of the extensive business of the Company. In March, 1918, Sir Wilson resigned his position as Chairman of the Company; and his resignation was received with keen regret by his co-Directors and by the staff, by whom he was held in high esteem.

After a short illness, the death took place, on Tuesday of last week, at West Norwood, of Mr. William Joseph Dibdin, F.I.C., F.C.S. He was 74 years of age, and used at one time to be frequently before the gas industry, more particularly in connection with his extensive investigations in the subject of photometry. Indeed, at one time his books were the only ones which dealt with this matter in a really complete manner. He was also prominent in connection with standard burner questions when they came before Parliament—naturally on the side of the London County Council, to which body he acted as Chemist and Superintending Gas Examiner for a period of fifteen years. On his retirement from this position towards the end of 1897, presentations by the officers and staff of his department testified to the esteem in which he was held by them. His successor was Dr. F. Clowes, who was also well known to readers of the "Journal" in connection with his investigations on the detection of dangerous proportions of explosive mixtures of combustible gases with air, on which subject he lectured at the meeting of the Gas Institute in 1896.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

June 19.—Industrial Gas Salesmen's Circle.—Meeting at the Council House, Birmingham. Inspection will be made of the industrial gas demonstration rooms and research laboratories of the Birmingham Gas Department, and visits will be paid to the Windsor Street heat treatment shops, and to the works of the Moss Gear Company, Ltd.

June 20.—London and Southern District Junior Gas Association.—Visit to the Cambridge Gas-Works.

June 24.—Southern Association of Gas Engineers and Managers (Eastern District).—Meeting at the Institution of Gas Engineers, No. 28, Grosvenor Gardens, S.W. 1, at 2.30.

June 22-24.—Institution of Heating and Ventilating Engineers.—Summer Meeting at Birmingham.

June 30.—Last Day for Coke Competition Papers.

July 9.—Coke Oven Managers' Association (Midland Section).—Visit to the works of Messrs. Stainby and Lyon, of Knottingley.

July 20-25.—Royal Sanitary Institute.—Congress at Edinburgh. H.R.H. the Duke of York has accepted the Hon. Presidentship of this Congress, at which Sir John Gilmour, Bart., Secretary for Scotland, will preside, and deliver the Inaugural Address. A health exhibition is to be held in connection with the Congress.

Sept. 15-17.—Irish Association of Gas Managers.—Annual Meeting in Belfast.

Oct. 19-21.—British Commercial Gas Association.—Annual Conference and General Meeting in Plymouth.

NATIONAL GAS COUNCIL.

Meeting of Central Executive Board.

The Central Executive Board of the National Gas Council met on Monday, June 8, at No. 28, Grosvenor Gardens. Alderman F. S. Phillips was voted to the chair, pending the election of a Chairman for the ensuing year.

Election of Chairman and Vice-Chairmen.

Mr. D. Milne Watson was unanimously re-elected Chairman for another year, and thereupon took the chair.

The four retiring Vice-Chairmen—viz., Alderman F. S. Phillips, Mr. Wm. Cash, Mr. J. H. Ellis, and Mr. F. H. Jones—were also unanimously re-elected.

Rating and Valuation Bill.

It was reported that the Rating Committee appointed by the Central Executive Board had considered the new Bill introduced by the Government, and had come to the conclusion that, save for one or two matters which it was proposed to discuss with the Ministry of Health, the gas industry saw no objection to the Bill.

Departmental Committee in Connection with the Law on Diversion of Highways.

It was reported that representations had been made to the Home Secretary as to the desirability of public utility undertakings being represented upon the above Committee. The Home Secretary had, however, replied that, as the Committee had now held several meetings, he could not see his way to agree to any further representatives being appointed to the Committee, but he promised to see that particular attention was given to the evidence of public utility associations.

Mr. Ogilvie was empowered by the Central Executive Board to give evidence on behalf of the Council before the Committee in question.

Mains in Public Highways.

It was reported that, despite the fact that a conference was proceeding between public utility associations and highway authorities, including representatives of county councils, upon the question of mains and cables in highways, the Northampton County Council were proposing to oppose the Draft Special Order of the Northampton Gas Light Company for the purpose of inserting a drastic protective clause in favour of the County Council. It was agreed that assistance should be accorded to the undertaking in certain directions.

Local Authorities and Gas Prohibition.

It was reported that several gas undertakings were confronted with the difficulty that their municipal authority had inserted a provision in tenancy agreements that their tenants should not use gas for certain specific purposes in houses belonging to such authorities. The question was discussed as to the position of the gas undertaking should one of the tenants give an order for the installation of gas. It was agreed that this was a matter of importance to the whole of the industry, and that Counsel's opinion should be taken thereon.

Analysis of Refractory Materials.

In the "Chemiker-Zeitung" for May 16, H. Schilling gives the following method of analyzing refractory materials, which allows the rapid estimation of the iron and alumina contents: One gramme of the finely powdered and sieved material is ignited in a platinum crucible to determine the loss on ignition. The residue when cold is moistened with distilled water, about 20 drops of concentrated sulphuric acid are added, and then the requisite amount of hydrofluoric acid. The contents of the crucible are stirred gently by shaking the crucible, which is then heated, at first gently and then strongly, over the blowpipe until all fuming ceases. After cooling, the fusion mixture is added, and the contents of the crucible gently fused. The mass is then dissolved in hydrochloric acid, avoiding any excess so far as possible, and precipitated with ammonia at the boil. The precipitate, together with the filter paper, is transferred, without washing, to the porcelain dish in which the original precipitation was conducted, and dissolved again in a few c.c. of strong HCl, the operation being conducted on the steam bath with continuous stirring. The filter paper disintegrates into its fibres. The solution is diluted with distilled water, precipitated afresh with ammonia, and washed until the washings are free from chlorine. The precipitate is then ignited in a platinum crucible, treated with a small quantity of HF and H_2SO_4, and ignited in the blowpipe until all traces of fuming cease. Subsequent weighing gives the content of the refractory material in iron oxide, alumina, and titanic acid. The iron content can be estimated by dissolving the residue in HCl, filtering off the small quantity of TiO, which may be present, and titrating the iron by any of the standard methods.

INSTITUTION OF GAS ENGINEERS.

ANNUAL MEETING,

AT THE

INSTITUTION OF CIVIL ENGINEERS, GREAT GEORGE STREET, S.W.

JUNE 9, 10, and 11, 1925.

President: J. FERGUSON BELL, Esq., M.Inst.C.E.

REVIEW OF THE PROCEEDINGS.

[For Full Report see p. 854.]

THE radiant morning of Tuesday of last week greeted 600 to 700 visitors to London for the Annual Meeting of the Institution; and thenceforward throughout the day and the week, the sun did its best to make things cheerful. The sun and shade temperatures on the opening day of the meeting were something to which we have grown unaccustomed; at one part of the following day it was hotter still—shade temperatures of 80° to 83° being registered in London. But no one complained; everybody merely said it was hot. There seemed to have been a conspiracy of silence about the discomforts of the intense heat; probably because there has been complaint enough about the want of sun, and when it came in bulk supply, it would have been ungrateful to say anything about it which might have appeared at all disparaging. Men come and men go; but nevertheless it seems to have become a tradition among gas men that—especially on the opening day of the Annual Conference—they should stay outside the meeting place for the purpose of greeting their friends. It has its good features and its bad. We like it because it gives an opportunity for a grip of the hand and a friendly word before getting into the serious atmosphere of the meeting room. But, on the other hand, it is not courteous to the President to let this freedom and pleasure run beyond the hour appointed for the start of the meeting. However, the Great Hall of the Institution of Civil Engineers was well filled by the time all had assembled—in fact, we doubt whether there has been a meeting numerically larger; and this is not surprising, for the membership has grown to about 1100. The Great Hall is commodious, and the hospitable accommodation afforded by the President and Council of the "Civils" is much appreciated. But many there were at the meetings who wished that that beautiful hall had better acoustic properties.

MR. J. FERGUSON BELL, J.P., M.Inst.C.E.

From general topics to others. The President (Mr. J. Ferguson Bell, M.Inst.C.E.) was prompt to time; and, despite the heat, he looked the coolest man in the whole assembly. It was a remarkable gathering that met the eye on the platform. There was not only the Senior Vice-President (Mr. C. F. Botley), the Ex-President (Mr. Samuel Tagg), the Hon. Secretary (Mr. W. E. Price), the Secretary (Mr. Walter T. Dunn), and other officers and members of the Council, but there was the Right Hon. Sir Alfred Mond, Bart., M.P. (President of the Society of British Gas Industries), Mr. W. Woolley (Chairman of the Derby Gas Company), the President of the National Gas Council (Mr. D. Milne Watson), and many others who are prominent in the organized work of the industry. Also there were gentlemen representing the gas industries of France, Switzerland, Belgium, and Norway; even India, Australia, and the United States had representatives there. It was a gathering international in composition, and bringing to a centre workers from the far-placed parts of the British Empire. Later on there was further evidence of the oneness of the world's gas industry by the presentation of a paper by M. L. Rolland d'Estape, President of the Société Technique de l'Industrie du Gaz en France, which was read in English by M. Baril. Municipal activity was worthily represented by the Lord Mayor of Manchester (Alderman Fred J. West, C.B.E., M.Inst.C.E.), who as the bearer of an honoured name in our industry, himself a keen worker, and one who has won a distinguished place in civic life, was very heartily received. There was also present the Mayor of Halifax (Alderman Waddington). Mr. H. C. Honey, the Director of Gas Administration at the Board of Trade, was another important guest.

A Welcome—Industry and Unemployment.

Some formal business was transacted; and then the President gave a warm welcome to the distinguished visitors and to the delegates from the Continent and from further overseas. What he said was endorsed by the hundreds of members, and so heartily that there was no room for doubt as to the complete and unanimous sincerity of the welcome. And as he rose to respond each speaker had a reception which was a vivid re-endorsement. Mr. Woolley responded, and so did Sir Alfred Mond and M. H. Zollikofer, who rendered as interpreter excellent service during the morning's proceedings. Sir Alfred Mond, probably under a misapprehension as to the time at disposal, spoke at length on the position of industry in relation to unemployment. Sir Alfred believes that the cause of depression in industry is the discrepancy between the cost of production and the money available for the purchase of goods. Can the gap between the two be bridged? Can we "marry" the

national expenditure on unemployment to the costs of production in such a way as to permit of the making of goods at a price which the consumer can pay? He thinks we can; and he believes the scheme he has put forward will do it. In other words, he considers that it would be far better for the country to spend part of the money now distributed in unemployment pay on bringing our products to a competitive price, so as to give the unemployed employment, than to continue to spend such large sums per annum on unemployment, and leave idle so much factory and man power and capital. Sir Alfred finds that the Swiss have anticipated him by three years by establishing a similar scheme in their watch-making industry; and the results he has suggested have been realized in Switzerland. The gas industry is deeply concerned in this question of helping trade to a greater activity, because it has a considerable business with many industries, and still spacious room for its growth to mutual advantage.

Extension of the Roll of Hon. Members.

There is one thing the members of the Institution always like to do, and, when they are agreed upon it, they do it enthusiastically. That is to honour those who have earned by good work their regard in the industry. The men whom they have honoured on this occasion are not only noted for good work, but their personal qualities have endeared them to professional gas men. First that doyen in the British gas profession (Mr. Charles Hunt) was placed upon the roll of honorary members. There is no need to extol his work and his virtues. They are recorded in the pages of the history of the progress of the industry during much more than half-a-century. Then the Rt. Hon. Alderman Fred J. West, C.B.E., M.Inst. C.E., the Lord Mayor of Manchester, had similar honour done him; and he keenly appreciated this act by the gas profession to one to whom service stands as a premier duty, as it did with his revered father. Then new links were forged with the co-workers of other countries by the election as hon. members of the Presidents of the American, Belgian, Canadian, French, Italian, Norwegian, Swedish, and Swiss Gas Associations.

Presentations.

Not many men have received the Birmingham Medal, and few, if any, can claim to have won it with greater distinction than Dr. Charles Carpenter. Upon him it has been conferred this year, by a unanimous vote of the Council, and, as we expected would be the case, the complete approval of the members of the Institution. He will prize it, as he feels and values the sincerity of the applause with which he was greeted as he went to the platform to receive the coveted (by gas men) symbol of their acknowledgment of eminent services and results of work—work showing originality and genius, and results marking progress. There was eloquence in the observations of the President; there was genuine feeling and thankfulness in the reply of Dr. Carpenter. There were also in his speech words formed from a life of study and observation of the gas-making industry which will be read with both interest and profit. They are reported on a later page. The charming reference of Dr. Carpenter to the work of his predecessor on the list of recipients of the Medal—Mr. W. Doig Gibb—was one of the many points which drew applause.

Then the "H. E. Jones" London Medal was presented to Mr. R. E. Gibson for his paper of last year on "The Construction of New Coal Gas Works at Garston, Liverpool." It was a splendid engineering contribution; and the members cordially endorsed the choice by the Council of Mr. Gibson as the recipient.

The winners of the Diplomas in Gas Engineering under the Institution Examination Scheme were then called individually to the platform to receive their certificates from the hands of the President. They represent the type of men the gas industry wants.

EARLY ON THE OPENING DAY.

Lord Moulton Memorial Fund.

Men like to pay tribute to the work of the great by establishing some form of memorial. It is not mere impulse or passing emotion which induces them to do this; but a real feeling of affection and admiration developed during the lifetime of the man. It is so with Lord Moulton, learned not only in the law, but in science; who in 1918—following his eminent services to the nation as Director-General of the High Explosives Department—was President of the Institution. Without a memorial, Lord Moulton's name would live through ages; but a memorial will tell future generations of how his contemporaries admired this brilliant man, who nevertheless was so self-sacrificing, delightfully unassuming, courteous, and approachable. A memorial to him is going to be established, and, with the full approbation of the members, the Institution will contribute £100.

The President's Address.

The members then settled down to listen to the President's Address. In this Mr. Bell gathered together those facts which give both gratification and encouragement regarding the progress of the industry, which in latter years

has been at a remarkable rate in respect of gas consumption, though we have had a set-back in regard to secondary products, the position of which the industry is seeking to restore. But in relation to gas, what are our prospects? Never were they of a more brilliant order. But though our horizon of opportunities has been enlarged, there will not be fullness of realization of the prospects without very definite work. That work is of a dual nature, and its parts must run on parallel lines. There must be proper education and training (this the industry is developing on good foundations), and there must continue to be persistent research into materials and processes with the view of increasing efficiencies and economies. But as the President points out, a full recognition is required of the importance of economic efficiency as well as of plant efficiency. It may at times be necessary to sacrifice some of the latter in order to secure the former—for example, by the purchase of cheaper small coals owing to their availability, though in other cases it might prove an advantage to pay slightly more for materials to secure a better efficiency, bearing in mind that carriage and labour are the same for good as for poor. Every case must be judged on local circumstances. Domestic heating and the industrial field are shown in the address to be promising lines for the development of business. Power experiences in Derby are dealt with; and it is plain that the President does not think the gas industry is doing all it might in that direction. The coke position, Government assistance to electricity, and much else is treated upon—well and practically. The deliverance gives the industry a good view of the current position, prospects, and problems, which in these times force themselves—and rightly so—to a leading place in our considerations. The address receives comment to greater extent in our editorial columns. It was listened to by the large audience with marked attention and interest, and was punctuated by applause. The appreciation of the members was faithfully expressed by Dr. Carpenter.

ANOTHER VIEW OUTSIDE THE INSTITUTION OF CIVIL ENGINEERS.

Annual Report and Accounts.

Evidently the members were quite satisfied with the annual report of the Council and the statement of accounts; for no sooner were these introduced, than they were agreed to, without comment.

The Education Scheme.

Always heartily received, Mr. F. W. Goodenough, the Chairman of the Education Scheme Advisory Committee, introduced the report on the past year's work and developments of the scheme. Taking first the report. It told of how the year had been one of steady, painstaking building. There is agreement with the Committee that, though progress has been slow, it will be more sure, because of the care that has been taken. The number of centres at which organized instruction in gas subjects is being given has increased from 11 to 21, with two other centres at which the earlier parts of approved courses are being taken. Further developments in this direction are in view. Of internal and external students combined, 110 applied for examination, against 60 in the first year. There were 30 others who applied, but were disqualified owing to lack of preliminary scientific training. That is significant, and shows the want of greater educational facilities, to provide which very earnest efforts are being made. Meanwhile, the students themselves can do something to repair the deficiency. There are many matters of an encouraging nature mentioned in the report, which need not be alluded to here, seeing that the document is prepared in pithy form, and so can be easily read. There has, among other things, been elimination of the overlapping of the Institution's Education Scheme and the work of the City and Guilds of London Institute. That is an excellent thing. The scheme has also been extended, so as to provide for all grades in the industry; and this has enlarged its effectiveness.

While this important work is in the hands of such "live wires" as the Chairman and members of the Committee, with Mr. Walter Hole as the Organizing Secretary, it will always be making progress; and whenever changes have to be made in the composition of the Committee, the good qualities in this regard of the members must be maintained in the new ones. The speech of Mr. Goodenough supplied the evidence that he would be better pleased if the average of students for examination was greater than 1 to 8 statutory undertakings in the kingdom, or only 1 to 14 of all the undertakings. Of course, this ratio will, as time passes, be improved upon. But it must be said that we are not convinced that all gas undertakings are doing their part in making provision for the thorough training of men for shouldering the responsibilities of the future. In some instances, there is a preference for this work to be done by others. That may be a compliment to the "others;" but to stand aloof from doing a part is not playing the game. There is a strong appeal in Mr. Goodenough's remarks in this respect; and we should like all gas administrators to read, mark, learn, inwardly digest, and act upon what he says. He also referred to the minor grouped courses which have been organized for those who require to equip themselves well for their work in life and for higher positions, but who do not aspire to the positions of professional men.

Aeration of Lighting Burners.

It will be remembered that Mr. J. W. Wood has for some time past been following-up the subject of the aeration of burners. At first the treatment was of a general character. Last year, however, a special study was made of burners used in heating appliances; and this year investigation has been carried out on the working of typical lighting burners. Perhaps the most outstanding result of the careful examination, which is recorded in the Thirteenth Report of the Research Sub-Committee of the Gas Investigation Committee, is that the amount of primary air injected by an ordinary lighting burner, working normally with a good illumination, is only about half the total air requirement. As Prof. Cobb points out, the significance of this is that effective illumination must depend largely on how the rest of the air is supplied. This shows what importance attaches to the accessory fittings which help to determine the manner in which the secondary air is supplied. The tests were conducted at pressures up to 4 in. W.G., mainly with gases of sp. gr. 0·49 and calorific value 460-470 B.Th.U. The average total theoretical air requirement per c.ft. of gas for combustion was 3·9 c.ft. It was found that there is a rapid increase of aeration with pressure up to 2·5 in. W.G., above which further increase is small. At this pressure the quantity of air injected in the inverted burners, when adjusted for best illumination, was 1·7 to 2·1 c.ft. per c.ft. of gas, though some burners were capable of injecting 2·5 c.ft. of air. The corresponding figures were higher for the upright burner. The air-port area provided when the shutter was fully open was in no case so small as to account for a low air-gas ratio; and the degree of aeration, it is interesting to note, was not proportional, even in the roughest sense, to the air-port area after a certain size had been exceeded. The heating-up of the lighting burner when in use materially reduced the quantity of air injected as compared with the performance on first lighting-up. This amounted at times to as much as a 40 p.ct. reduction. With an upright incandescent burner, the use of a chimney exerted no appreciable effect upon primary aeration; the improvement by its use being apparently due to more effective secondary aeration.

During the year Mr. Wood paid special attention to the determination of the specific gravity of gases. The determination by the effusimeter is apt to be erratic, while the making of a complete gas analysis is a tedious process. The gas engineer should have a means of determining density; and Mr. Wood has examined in detail Mr. Blackie's method (described in Technical Paper No. 5, Fuel Research Board), which, he says, when applied with proper precautions, is both accurate and comparatively rapid in working. It is capable of yielding results correct to ± 0·002 with ordinary town gas (sp. gr. 0·5). The report also includes a critical review of the methods of gas analysis adopted in the course of the investigations. It is interesting to note that all combustions were made over copper oxide in a silica tube. The chief advantages of this method are that a much larger volume of gas can be burned than by explosion, thus giving greater accuracy in measurement; combustion can be extended over sufficient time to ensure completion; there is no careful adjustment necessary to secure the right composition of an explosive mixture; and no auxiliary supplies or analyses of oxygen are required. The combustion tube is evacuated before and after combustion, using the gas burette as a mercury pump. This is only one of many valuable observations made by Mr. Wood in an appendix to the report.

Corbet-Woodall Experimental Gas Plant.

Readers of the "JOURNAL" will remember that in April, 1924, the Corbet-Woodall Experimental Gas Plant was inaugurated at the University of Leeds. A detailed description of the plant is given in the Fourteenth Report of the Research Sub-Committee of the Gas Investigation Committee. Dr. Parker and his assistants, Mr. Kerr and Dr. Monkhouse, have been occupied in getting the plant into a proper condition for carrying-out reliable experimental work, and in making preliminary tests. Many smaller fittings necessary in an installation intended not only for demonstration purposes, but also for the investigation of definite problems, have been added. A short while ago we inspected the plant, and were able to see the many minor modifications which had been necessitated. Gas making and carbonization trials have been carried out, and the performance of the condensing, scrubbing, purifying apparatus, &c., examined. The installation, it should be emphasized, is not a small-scale model of a gas-works, but contains many features which differ from usual practice. This fact has made it necessary to conduct preliminary trials before proceeding with a definite research programme. As a result of the tests and alterations, the suitability of the horizontal setting and auxiliary plant as a carbonizing unit has been established. Dr. Parker states that tests on the vertical retort setting are now practically complete, and that it is hoped to embark on a research programme almost immediately.

As an appendix to the Fourteenth Report a brief description of a method of preparing coke sections is given. It is pointed out that the examination of a lump of coke with the object of determining its texture is normally a difficult matter. The method described, which is due to Dr. Rose, of the Koppers Company, consists in filling-in the pores and cracks of a plane section with a suitable white cement, and polishing the surface so obtained. The cell walls of the coke are rendered easily visible against a strongly contrasting background, and inert materials such as shale are clearly brought out.

After reading the report, the thought remains that there is need for action along definite and practical lines. Among the great problems confronting the industry at the present time is the production of a coke suitable for domestic use. We want to know what is the right texture which will ensure easy ignition and free burning, and how coke having these desirable characteristics can best be manufactured. It occurs to us, for example, that the vertical setting could be used for investigations having this object in view. Research workers should not become so absorbed in their work that they fail to realize the ever-changing needs of the industry. What is of first-rate importance at a certain period may after a few years become of secondary value, due to entirely changed conditions; and it is a grave mistake to devote time to a subject which has but little relation to the demands of the day, though it may be of absorbing interest to the workers themselves.

The Tankless Gasholder.

British gas engineers have now had a very thorough introduction to the tankless (piston, dry, or waterless—which adjective is to become standardized?) gasholder. The "JOURNAL" claims an early reference to the invention, in May, 1915. At that time the Augsburg-Nürnberg Company were trying-out small holders of the tankless type, in which the sealing liquid was distributed from a tank carried on the centre of the disc; the tank being supplied from an open fall-pipe depending from the roof and fed from the collecting annulus in the base. The next news was supplied by M. Bonnet's paper to the Société Technique in 1922, which must have been inspired by the commencement of work on the Douai holder. Last year the latter was the main feature of the delightful excursion from Paris; and the less fortunate members of the Institution were able to inspect a scale model of it at the "Electricals" earlier in that memorable week. At Douai M. Arbel gave a lecture at the base of the holder itself, which then became a veritable Tower of Babel as the large party of visitors climbed all over and inside it.

Now M. Rolland d'Estape, President of the Société Technique de l'Industrie du Gaz en France, and Honorary Member of the Institution, has favoured the latter with an interesting paper giving further details of the holder at the Etablissements Arbel at Douai. The capacity of the vessel is 970,000 c.ft., and could be increased by half on existing lines. The height of the structure is 118 ft. to the eaves; the diameter of a circumscribing circle is 111 ft.; and the 88½-ton disc throws a pressure of nearly 4 in. W.G. The main details of construction are well known now; but interesting particulars as to the partitioning of the sealing fluid containers and the practically fool-proof working of the pumps are given for the first time in the paper.

We remarked above that engineers in this country have now received a thorough introduction to the dry gasholder; and when our friends on the Continent are heard extolling its virtues, and the formidable list of advantages of the design is read, it seems strange that no report

comes to hand of a contract for a works in these Isles—for the economy realizable is set at 5 to 20 p.ct. for holders above 350,000 c.ft. capacity. Is it a case of insularity or our inherent conservatism and dislike of new departures? Is it distrust of the lofty and permanent structure required for a dry holder of even medium capacity? As to a large example of the design in America we have at present no definite facts or figures. Let us examine the advantages as enumerated by M. d'Estape.

The necessity for warming the tank and the cups is removed, and with it the cost of installing and maintaining a boiler and pipes for the purpose. This is something to appeal to the gas engineer of the Continent or the States, but is apt to be met with apathy on the part of the great majority of gas men whose responsibility lies in our less rigorous climate. The constancy of the pressure thrown by the disc of a dry holder constitutes a very real advantage, enhanced by the fact that by the simple expedient of placing concrete blocks upon the disc, the pressure can be varied between wide limits—in the case of the Arbel holder from 10 to 300 mm. W.G. We are reminded of the often useless (so far as pressure, but not storage, is concerned) top lift of column or spiral-guided holders, now that, through legislation, more thought has to be given to minimum pressures in consumers' services at the far end of a district. Mr. Norton Humphrys dealt with the subject on p. 254 of this volume of the "JOURNAL." As regards the next point—rigidity under wind pressure—we read that "columns can be neither completely rigid

FOUR OF THE DIPLOMA WINNERS.

Messrs. T. Dyson, T. H. Prater, C. Bateman, and T. V. Blake.

nor absolutely vertical, and the lifts of the telescopic holder are subject to violent wind stresses." That is so; but they have stood the strain extremely well. The skill and knowledge of the designers have allowed the pressure to be taken up and distributed without danger to the structures; and modifications to such essential details as the carriages of spiral holders have ensured the sweetest working even in the fierce storms which assail our coasts. Paint, of course, need only be applied to the exterior of the tankless holder, for the interior surface is continuously dressed with an excellent preservative. Comparative figures in this regard would be welcome. It should be borne in mind that the spiral-guided design has greatly reduced the cost of this service by eliminating the most troublesome part of the job; and the external flanges and the angles of the polygonal structure add many square feet to the surface and many hours of work for the painter. The foundation work is a source of great economy in the construction of the dry holder, which must account for a considerable portion of the stated 5 to 20 p.ct. over-all economy, for we learn that the "necessarily precise plating work called for by the tankless design is costly."

M. d'Estape produces but one disadvantage to weigh against the foregoing—the possible irregularity of the tar pumps, and their running costs. We are not impressed by this, for the weir arrangements in the tar wells give plenty of rope to the engineer who has a repair to do; and a few 1½-H.P. electric motors each running for a summer-time maximum of about three hours in the twenty-four do not insert an alarming figure in a profit and loss account. To the solitary disadvantage quoted, however, we would add one—æsthetic, perhaps. Some advocates of dry holders insist upon their sightliness as compared with their forerunners; but we believe that the great majority of people would rather live near, or see on the skyline, a spiral-guided holder. Its elevation is not altogether unpleasant, at times it almost disappears; painted green, it does not seriously disturb the harmony of a view—witness the Christchurch holders from the London road; withal, there is life about it. Whereas the tankless holder for ever rears its head aloft.

Points from the Discussion.

Keen disappointment was felt that the President of the Société Technique had been unable to leave France and present his paper in person; but a most efficient substitute was M. Baril, of the Société d'Eclairage, Chauffage, et Force Motrice, who admirably rendered the English translation of the paper. We must honestly confess that the discussion was as informative as the paper itself, and went strongly in favour of the tankless design. The President, in opening it, made a strong point of the dryness of the gas from these up-to-date containers. Mr. Leather indulged in mild criticism, and was followed by the heavy artillery of Mr. Milbourne. He revealed the interesting fact that the inspection galleries round these holders serve a secondary purpose in strengthening the structure against wind pressure. In praising the new design, he laid strong emphasis upon the absence of corrosion, which has caused engineers furiously to think since wrought-iron and steel plates deteriorated in quality—or town gas, as some opine. Mr. Milbourne considers that a working example is needed in this country to overcome the conservatism of our engineers; and he realizes that the tankless holder in this country has to compete with the spiral-guided design, which means that its economic cost limit must be considerably higher than abroad. Mr. G. M. Gill imparted the information that in the States, whence he has just returned, orders have been placed for dry gasholders of a total capacity of some 65 million c.ft.; two or three to be of 15 million c.ft. capacity. This news is astonishing. It is extraordinary, too, that spiral-guided holders are practically disregarded on the Continent and in America. Several minor points were then raised and answered in French by M. Baril, who was then heartily thanked for his presence and the trouble he had taken.

New Carbonizing Plant at Stretford.

The purely practical paper is a welcome necessity; and Mr. R. E. Gibson's contribution on the Garston Works last year (for which he has been awarded the H. E. Jones London Medal) had a counterpart this year in the "Selection, Design, and Construction of New Carbonizing Plant at Stretford," by Mr. W. M. Carr. Without touching upon design and construction, the author could have prepared a weighty contribution upon selection of plant alone; but he skilfully compressed a great amount of argument into a comparatively small space, and set out his case with extreme clarity. The problem of selection, he says, has become increasingly difficult during the last few years, owing to the great fluctuation in the relative values of coal and residual products; and his decision was made in favour of the type of plant best suited to meet these variations. That an extension of capacity was essential became obvious when 641 million c.ft. was sent out in 1923, as compared with 485 millions in 1921; the maximum day's sale being 2,609,000 c.ft. in the winter of 1923-24, as against only 2,138,000 c.ft. in the previous winter. Further, in view of the undertaking serving Trafford Park as well as a rapidly growing residential area, 7½ p.ct. annual increase was budgeted for instead of the more usual 5 p.ct.

With full realization of the fact that the cheapest gas is not necessarily dependent upon the highest yield of gaseous therms, Mr. Carr took into consideration his

facilities at Stretford for the purchase of cheap slacks and the low freightage which he enjoys. An extensive coke market and the necessity for high calorific value gas (in order to avoid capital expenditure on mains) were important factors. Further, in changing hands, the undertaking had already suffered an increase of 140 p.ct. in capital charges, and a close watch had to be kept upon expenditure. Such considerations left verticals, chamber ovens, and horizontals in the running. Verticals were ruled-out because of the expediency of carbonizing local slacks; and chamber ovens suffered disadvantages in that the units were deemed rather large for a medium-sized undertaking, that charging and coke handling are somewhat complicated, and that there would be a possibility of gas quality varying awkwardly between charging times. However, chamber ovens had the distinction of being compared with horizontals for working costs on a make of 650 millions per annum—taking the raw coke consumption of the former, with reversible generators and outside producers, at 12 p.ct., as against 15 p.ct. with the latter. It appeared that the extra coke yield would be almost balanced by extra capital charges, and there was the probability that the resulting coke—from carbonizing slack in the ovens—would be unsuitable for domestic purposes. The deciding factor was the urgency of the work—horizontals could be installed in a shorter time.

So horizontals won the day, and it was decided to construct a new house containing nine beds of tens (24 in. by 18 in. by 22 ft. retorts), and then proceed with rebuilding the old house with the substitution for the old plant therein of two benches of eight settings each. Thus the total capacity will be 6 million c.ft. of straight coal gas a day; the retort-houses being served by one set of stoking and coal and coke handling machinery. Before proceeding with the second section of his paper, Mr. Carr commented upon the Wollaston producers which it is intended to instal, and developed an interesting comparison of the economics of retort heating by producer gas and coal gas. The Wollaston producer has been proved to function efficiently even with coke breeze through a ½-in. mesh, owing to the fuel being passed over a series of trays by mechanical scrapers—a process which first allows it to dry, and throughout its progress permits free passage of the blast. As for outside producers in general, their heating efficiency is about 16 p.ct. lower than self-contained ones; but the possibility of employing rough slack or breeze persuaded Mr. Carr that in the Wollaston machine he had a good thing. It must be recognized that outside producers allow a portion of the gas to be used for dilution of rich coal gas.

As regards retort heating by coal gas, this is often economically possible near the coalfields (providing there is ample carbonizing plant to meet the demand for gas) for the net cost of coal approaches vanishing point under certain conditions of the residuals market. Equivalents of gas and coke for retort heating may be taken as 40,000 c.ft. and 1 ton respectively; and the costs at Stretford would work-out approximately to 2s. 6d. and 3s. 5½d. per ton carbonized for gas and coke respectively—allowing 2½ cwt. of coke per ton. These are gross figures; but when credit is taken for the extra coke for sale which would result from gaseous firing, and a debit is made for the theoretical maintenance and capital charges of the extra plant required, the saving realizable by coal gas firing is shown as about 17d. per ton. The author points out that on the basis of the above figures, had surplus carbonizing plant been available during 1924, and the whole plant adapted for coal gas firing, a saving of approximately £4000 could have been effected on a make of 641 million c.ft. Such were the main considerations which led to the adoption of settings with normal self-contained producers and supplementary arrangements for working on producer gas, coal gas, or a mixture from external sources. For the design, Mr. Carr was jointly responsible with Mr. H. J. Toogood, of Messrs. Robert Dempster & Sons, Ltd.

In the section of his paper dealing with design, the author refers to a great many details and advances numerous valuable opinions; and it would be useless to attempt a *résumé* of the matter, which merits close study in connection with the drawings. We would, however, direct attention to the design adopted for the self-contained producers. Mr. Carr favours a producer as nearly square as possible, holding that a higher efficiency is secured therewith than with the long narrow shape. The retorts are of 95 p.ct. silica; and the keystone of the producer arch is extended upwards and incorporated as part of the elliptical combustion chamber (the complete specification relating to the latter design has just been published by the Patent Office and abstracted in our columns). The suggested procedure for changing over from coke to gaseous firing is described; and then the author goes on to discuss at some length the modified Congdon standpipes which he has installed, and the conditions he considers essential for their successful working.

In the third section of the contribution, interesting points from the actual erecting work are mentioned; and it is shown, from observations and figures collected over four months' working, that the installation will live up to expectations. Lancashire and Yorkshire mixed slacks, under 1-in. screen, worked in 12-hour charges, over a six-day experimental run gave 75·96 therms per ton of 529 B.Th.U. gas, with 12 cwt. of coke available for sale. The average inerts totalled 10·7 p.ct. The moisture and ash contents of the coal were 3·3 and 11·0 p.ct. respectively, fixed carbon 55·7 p.ct., and volatile matter 30 p.ct. The heat balance showed a net efficiency of carbonization of 82·04 p.ct. The normal weight of charge with the Fiddes-Aldridge simultaneous stoking machine is 16 cwt. with washed slack, and 17 cwt. with dry slack. Excellent testimony to the standpipe system is found in the fact that it has resulted in a reduction of the H_2S content at purifier inlet from 749 to 594 grs. per 100 c.ft.

A Good Discussion.

As the President remarked, an adequate discussion of Mr. Carr's paper might take a day, full as the contribution was with considered opinions and *raisons d'être*. Both Mr. Bell and Mr. Toogood, who followed the President, referred respectively to the author's father, Mr. Isaac Carr, as "the one who supplied the cheapest gas in the world," and "whose name is brought to mind by the very mention of cheap gas." Mr. Toogood, expert that he is, raised numerous points and stressed the fact that the author had all through kept the variable residuals market uppermost in his mind, and especially the Stretford coke market. This speaker's comments on the construction of the silica settings, the producers (which he designates the driving force of any setting), the screen-bar grates, and the tube regenerators should be studied, for a précis would be superfluous. Mr. Collett of Sheffield was at variance with the author as to coke quenching—he believes in spraying in front of the settings rather than mass quenching in skips; and Mr. W. B. Leech criticized the size of retort for the slack coal used, thinking that at Beckton the coke is better and that more therms are obtained with a smaller section. However, experiments are being carried out by the Gas Light and Coke Company, and definite results would be appreciated. Mr. R. E. Gibson, remarking upon the author's use of slacks, supports a contention which we ourselves have stressed from time to time—that if all adopt some particular method of carbonization with a certain kind of material, the price of the latter will soar, and economy through the process will disappear. The Chief Engineer of the Gas Light and Coke Company added his congratulations to Mr. Carr, especially remarking upon the success obtained with the modified Congdon standpipe. We are glad that the author in his reply took exception to Mr. Samuel Shadbolt's remark "that considerations of the conservation of our coal supplies did not trouble Mr. Carr." Nowadays, this is rather a serious allegation against an engineer; and it is difficult to see on what hypothesis Mr. Shadbolt based his comment.

The discussion had to be closed owing to pressure of time, and the author replied fully to the many points raised. More than one speaker in the discussion regretted that the paper had not been available earlier, so as to allow of fuller consideration and the sifting-out of controversial topics.

The Benevolent Fund.

First thing on Wednesday morning, consideration was given to the affairs of the Benevolent Fund. The income for the year amounted to £534 10s.; and assistance to widows, orphans, and aged members amounted to

£489 18s., and other disbursements left a credit balance for the year of only £5 16s. 11d. The demands upon the fund this year will be much greater. Although there has been a response to the President's appeal for increased funds, and one of the new honorary members of the Institution (the Rt. Hon. the Lord Mayor of Manchester, Mr. Alderman Fred. J. West) has contributed £100 for investment in favour of the fund, the Committee feel that their limited financial resources impose a great restriction upon their relief of genuinely necessitous cases.

Wrought-Iron Tubing Inquiry.

The first technical item on the *agenda* for the same sitting was the report of the Wrought-Iron Tubing Inquiry Committee, whose Hon. Secretary (Mr. R. H. Ruthven) presented it. This is a subject which has very opportunely been taken in hand. It was first raised by a letter addressed to the "JOURNAL" in 1923 by Mr. Albert Stokes, Gas Supply Manager of the South Metropolitan Gas Company. Early in 1924 the Institution forwarded a questionnaire relating to the matter to 309 gas undertakings making 100 million c.ft. and upwards per annum. Opinion is about equally divided as to whether there has been, or has not been, any decrease in the "life" of gas barrel, compared with supplies prior to or during the war. One of the questions was: "Do you specify that such material should be made from wrought-iron and not from mild steel strip?" Of those who replied 60 p.ct. specify that material supplied should be made from wrought-iron and not from mild steel strip. From answers received to a question as to whether the material is submitted to any test to ascertain its quality, it is clear that it is desirable that steps should be taken to formulate a standard test. On the evidence obtained, as set out in the appendices to the report, it is the unanimous view of the Committee that steps should be taken by the gas industry to ensure that gas barrel supplied to the industry is composed only of superior quality wrought iron. To that end it is suggested that a specification and tests should be drawn up; and for that purpose the services of a metallurgist should be commissioned. In Appendix II., reference is made to a simple etching test for the rapid differentiation of steel from wrought iron. The Committee recommend the use of wrought-iron piping; but at the same time they direct attention to the deleterious effects produced upon gas barrel—whether of iron or steel—arising from internal corrosion, due to the presence in the gas of carbonic acid, oxygen, and water vapour. It is suggested that all practicable steps should be taken to reduce to the minimum the amount of oxygen contained in the gas. Valuable accounts are given of work on the subject carried out by the South Metropolitan Gas Company and the Gas Light and Coke Company.

Interesting Comments.

As mentioned above, the report was introduced by Mr. Ruthven. It was stated by him that the Council of the Institution had not had time thoroughly to consider the recommendations of the Committee, and after this has been done, if approved, the Committee will go forward with the matter. The next thing the Committee would wish to do would be to consider and discuss the question of the specification with the manufacturers of tubes, in order to obtain their opinion. Some interesting experiences which Mr. E. F. Keable had at Gorleston during the bombardment in April, 1918, were given by him, and plates from a holder which had been pierced by enemy shells were shown, together with photographs. In our report of the discussion, we have included three of these interesting mementoes. He also supplied information as to the manner in which repairs were effected. In connection with these, the water had to be lowered in the tank, to permit of the work being executed from rafts. This gave him a good chance of examining what was going on inside the holder. He described the condition as nothing short of a shower bath. He was surprised at the amount of evaporation which took place in the holders. The water vapour was constantly rising, and forming beads on the crown, and then falling into the gas. Water troubles on the district have led him to think deeply about this matter, and, in order to reduce the evaporation, he now uses a paraffin surface for the whole of the water inside the holders. This remedied the trouble. The amount of paraffin oil used in a 100-ft. diameter holder is 120 gallons; and this is introduced just before the hot weather comes. Trouble with a 3-in. tube used in the water-feeder to a waste-heat boiler evaporating some 4500 lbs. per hour, was mentioned by Mr. H. D. Madden, of Cardiff. This tube got badly pitted in about three weeks. The curious thing about it is that other boilers have not given any trouble in this way, and Mr. Madden has not been able to discover the cause. It was announced by the President that the Committee have engaged the services of an experienced metallurgist, who has already prepared a draft specification which will receive the careful consideration of the Committee. Though the remarks made did not deal specifically with the report, it was clear that the feeling of the members was that the matter is of considerable importance.

Refractory Materials.

As usual the report of the Refractory Materials Committee is both lengthy and useful. Thanks to the Privy Council for Scientific and Industrial Research, it has been possible to present reports of the work of the British Refractories Research Association which are of special interest to the gas industry.

Of particular importance is a communication by Mr. A. J. Dale on "The Relation between Under-Load Refractoriness, Ordinary Refractoriness, and Composition, Physical and Chemical, of Refractory Materials." It has long been realized that cone refractoriness is a very limited guide to the prediction of the behaviour of a brick in a retort setting, principally because there it is under stress, and therefore fails at a much lower temperature than that required to cause the material to flow under its own weight, as in the old specified laboratory test. In addition, the time for disposal on any test of refractoriness is very limited compared with the required life in practice. Hence it is desirable that the test should yield data which can be extrapolated to eliminate the time factor. In the report Mr. Dale records measurements of the strain exhibited by both clay-grog mixtures made up in the laboratory, and sixteen firebricks representative of manufacturers' products, when heated under load up to, and maintained at, 1350° C. for two hours, and also when heated up to the temperature at which complete collapse occurs. For each material chemical and physical properties, as well as the cone refractoriness, determined by the commonly-accepted methods, are set out. It is in the interpretation of the results, together with a suggested classification of firebricks based on their behaviour under load at high temperatures, that the paper is most welcome. Each brick exhibits a thermal expansion up to some temperature, at which it is neutralized by subsidence. The point is indicated by a levelling-out of the dilatation curve; and the corresponding temperature must be regarded as being the lower limiting value of a critical range which is of fundamental importance in refractory testing. The commencement of pronounced contraction of the test piece marks the upper limit of this temperature range. By following the subsidence of the material throughout the two hours during which it is maintained at 1350° C. in the refractory load test, curves can be plotted, and from their slope it becomes possible to prophesy the extent of subsidence under prolonged heating. Also, the characteristic constants of these curves fall into three classes corresponding to the three types of failure of refractories under stress. Some products show little sign of distortion right up to the temperature of complete failure, when the test pieces shear abruptly with well-defined fracture; others very gradually deform, and at the temperature of complete failure squatt, there being little sign of fracture; while the remainder are intermediate the extremes, and show mild signs of squatt and of fracture. In consideration of refractoriness *per se*, one would recommend the first class of products but for the fact that some additional advantage in the way of reduction of porosity and reduced penetration is gained by slight subsidence of the materials; and it may well be that for refractoriness the products of class three are the

best all-round ones. Study of this and other papers shows that the assessment of the qualities of bricks can only be made by gas engineers through their own research departments, who will find papers like Mr. Dale's invaluable in pointing out the way for systematic classification of refractories according to laboratory tests, which should be coupled with large-scale experience.

Speaking of the selection of high-temperature insulating materials, Messrs. A. T. Green and H. Edwards point out that this cannot be based on insulating efficiency alone. A durable construction at the temperature and under other conditions of working is of first importance. Slag wool, for instance, should not be subjected to temperatures over 700° C. for any length of time, because of its tendency to disintegrate and form a powder, with consequent reduction in the occupied volume. This loss in structure is accompanied by a great reduction in insulating efficiency. Before selecting an insulating material it is advisable to have a complete knowledge of the circumstances of its future use, particularly regarding the face temperature to which it will be subjected. The following data will then serve well in the selection: Comparative cost, insulating efficiency, refractory test, porosity, mechanical strength, and the temperature at which the material begins to lose its structure.

The 1912 Gas Engineers' Specification for refractoriness has led to slightly variable results according to which of the two optional methods was adopted. The Refractories Committee have now remodelled the test under the title "The Gas Engineers' Refractoriness Safety Test," which is described in a paper by Messrs. T. F. E. Rhead and R. E. Jefferson. The temperature at the first sign of fusion on a cone of standard size is to be regarded as an index of refractoriness. The decision to avoid introducing a load test as employed in work detailed elsewhere in the Committee's report is claimed justifiable by the simplicity of the suggested test and the fact that any load test as now employed does not sufficiently conform with practical conditions as to be regarded as final. Attention is drawn to the necessary care in the measurement of the test piece, and useful hints for obtaining increased accuracy in this direction are given.

Other matters of considerable interest are dealt with in papers by Messrs. T. F. E. Rhead and R. E. Jefferson on "A Few Experiences with Refractories in Vertical Retorts;" and by Mr. A. J. Dale on "An Investigation of the Effects of Load, Temperature, and Time in the Deformation of Firebrick Material at High Temperature," and "Some Fallacies to be Avoided in the Standardization of any Method of Testing the Load-Bearing Capacities of Refractories at High Temperatures; and a Suggested Method for Standardization."

Need for Co-Ordination of Information.

In the course of the discussion on the report, Sir Arthur Duckham was responsible for a suggestion which was entirely endorsed by other speakers. It was to the effect that a great deal of assistance could be given by having a central committee to deal with information. In his own firm, for example, something like £3000 a year is spent in firebrick research alone; and all the information gained is absolutely at the disposal of the gas industry. This is the true spirit of research; and a general recognition of this by manufacturers in other fields would heighten the rate of progress. Sir Arthur draws attention to the excellent work being done by Mr. Rhead at Birmingham, and by the Gas Light and Coke Company. If, he suggests, we had some system of co-ordinating this work, we should make considerable headway. There is no question that refractories play a vital part in the process of gas manufacture. If, for example, we can get a plant which would have a working life of (say) fifteen years, think how this would reduce the cost of carbonization. Mr. Rhead is of opinion that, if gas engineers only realized the variations in materials, even from good firms, they would go in for testing a good deal more than they do at present. He has found that some refractory material manufacturers have erratic mixtures because they measure by the barrow load, and not by proportioning machinery. There would seem to be two extremes in this country. Some firms have reached a high degree of technical efficiency; others trust to luck that the material will come out all right—which it frequently does not! Mr. Williams, of Altrincham, asked whether a simple test, suitable for a small works, could be devised which would give an approximate indication of the quality of the material; but Mr. Leather said it was impossible, with such complex substances as refractories, to have such a test. Mr. Leech, referring to the generosity of Sir Arthur Duckham, said that, if the Institution took the matter up, they would doubtless find that manufacturers both in this country and abroad would be willing to give them the benefit of the information which they had gained. On a recent visit to the Continent, manufacturing firms had placed any amount of information at his disposal. Mr. Gill thinks that many engineers seem to forget the existence of the Institution of Gas Engineers Specification for Refractories, and emphasizes that more use should be made of it. He is of opinion that an under-load test would prove of great value. The President observed that full support should be given to the work of the Refractory Materials Committee. It mattered not how well a setting was designed, or how well it was constructed, unless the material would stand the heat and superincumbent pressure in ordinary practice it would be of no use. Mr. Leather, in the course of his reply, stressed the point that it was not sufficient that goods be ordered to a specification; it must be seen that they really were to specification.

Illumination.

The report of the Sixth Session of the International Commission on Illumination was presented by Mr. Watson, of Doncaster, and Mr. Dunn, the Secretary of the Institution of Gas Engineers. The representatives at the Conference, which, as readers of the "Journal" will remember, was held in Geneva last year, numbered about 40, covering gas, electricity, and physical interests; and they came not only from our own country, but from France, Italy, Switzerland, the United States, Poland, and as far away as Japan. The papers submitted at the conference, abstracts of which appear in the report, were connected with photometric dimensions and symbols, heterochromatic photometry, factory and school lighting, and automobile lighting. One or two new features were introduced, and there was a natural transition from what may be termed the scientific or theoretical consideration of illumination to the practical application of lighting generally. Decisions were reached at the 1921 conference as to certain photometric quantities, such as luminous flux and intensity. At the meeting last year further progress was made; and definitions covering brightness, reflection, absorption, transmission, and the like were formulated, and these are included in the report. The submission of three papers on practical engineering, and methods of publicity among all classes of consumer, which referred to the various illuminants that are available to the public, was something new. Mr. Watson suggests that our own country is not behind the United States in matters of this description, and that the larger undertakings, and many of the smaller ones, are acting much on the same lines as suggested in the papers. Work at present in hand consists in the classification of streets and thoroughfares in order of illumination requirements, in the study of the means for higher illumination standards for streets, in view of the increased amount of fast-moving traffic, and the desire of increasing the height of the light source, in order to get a greater distribution of light on the ground, and to avoid the possibility of glare.

During the discussion on the report, Mr. Davies, of Chesterfield, suggested that the problem of reflection should be investigated with a view to improving street lighting. He mentioned that the electricity industry was experimenting on these lines. In regard to this, Mr. Watson said that the Sub-Committee on Street Lighting had this point in mind. Those members of the Institution of Gas Engineers who had the good fortune to visit the Physical Laboratories of the South Metropolitan Gas Company on Thursday last were able to see work of this nature in progress, the outcome of which will be awaited with interest. Mr. Ferguson Bell stressed the point that it is not by any means the intention of the Institution to lose interest in the use of gas for illumination purposes.

Effect of Ash in Coke Production.

The Gas Research Fellowship Report describes what effect the addition of 5 p.ct. of each of a number of common inorganic compounds to an almost ashless Yorkshire coal prior to its carbonization at 500° and 800° C. has upon the chemical and physical properties of the cokes produced. When carbonizing at 800° C., iron oxide, and, to a smaller extent, lime and calcium carbonate, reduce the amount of nitrogen left in the coke, while alkali has the reverse effect. The sulphur contents of cokes produced with the addition of iron oxide, lime, caustic soda, and sodium carbonate were higher than that of the "pure" coke; the greater difference being with the iron oxide and calcium oxide. Though the "iron oxide" coke had as high a total sulphur content as the "calcium oxide" coke, its sulphide sulphur content was much less. This is explained by the oxidation, during the cooling of the coke, of the ferrous sulphide to free sulphur and free iron, which latter constituent was detected qualitatively in the coke. The addition of sodium carbonate was most effective in producing a hard and compact coke of more than double the crushing strength of the unadulterated material. Iron oxide yielded similar results in a less marked degree, but the presence of caustic soda completely destroyed the coking power of the coal.

Judging from the higher volatile contents of the low-temperature cokes containing added oxides, the expulsion of volatile matter from the coal had been retarded by the presence of inert material, most noticeably with iron oxide. This is most interesting, and calls for further investigation. Alumina and silica in the proportions used appear to be without material effect on either the physical or chemical properties of the cokes yielded.

We do not think the report calls for much further comment, for it is not very fruitful as an "idea-giving" medium. It seems to us a great pity that further investigation was not carried-out on the potentialities of last year's Fellowship Report, which bristled with practical possibilities. It may be remembered that Mr. Madden, of Cardiff, asked what size of coke was most suitable for a water gas generator. This is a question which still remains unanswered; and it is just such questions as these which require investigation. A general haze of data and statistics is all very well; but research work, like all other forms of activity —be they scientific, literary, or commercial—needs to be channelled, and the concrete wall of complexity is most easily broken by repeated attack at a point which calls for immediate attention. In view of the difficulties which the gas industry is having to face, the subject of this year's Fellowship Report, though highly interesting, is, to the outside observer, not of first-rate importance.

Dr. Lessing, however, whose work on the catalytic effect of individual inorganic compounds on the carbonization of coal is well known to readers of the "Journal," and who was the only speaker in the discussion on the report, certainly does not hold this view. He referred to the influence of the ash on the carbonizing process as being enormous, and held out the hope that realization of this would lead others to pursue this line of investigation. As to the report itself, he referred to it as an exceedingly important piece of work, and said that in general the results put forward confirmed his own working. Dr. Lessing is of opinion that all work on carbonization will have to be reconsidered in the light of the influence of the inorganic constituents of coal on the yields of volatile therms in the form of gas and tar. After voicing a warning to the effect that the values for crushing strength of cokes determined on small specimens should be treated with great caution, he called attention to the method of carbonizing coal in the form of fine particles which has been adopted by H. E. Newall and F. S. Sinnatt, who, as was mentioned in the "Journal" for Jan. 7, state that heating first produces an ordinary large bubble structure, followed by the production of hollow spheres, known as "cenospheres." Dr. Lessing thinks that this method of attack may yield fruitful results.

Gas Testing in Small Country Places.

Prof. C. V. Boys has the priceless gift of holding the attention of a large audience. Those who had the good fortune to be present at the meeting of the Institution in 1922 will understand what is meant by this short sentence, and will remember the delightful account which he gave of his recording calorimeter. At that meeting all were impressed with the amazing fertility of Prof. Boys' mind; and the paper on "Developments in Gas Calorimetry" which was read at this year's meeting of the Institution is another reflection of his wealth of ideas. He mentions that, in carrying-out their duties, the Gas Referees have been oppressed by the cost and elaborate procedure which have grown up round the ordinary water-flow calorimeters, and which make their provision a serious burden in small country places. This applies less to the equipment within the testing place than to the time required of the gas examiner and the tedious nature of the operation which he has to conduct. With a view to reducing this burden, Prof. Boys has designed a simple equipment which he describes in detail in his paper. As one would expect, it is a highly ingenious and carefully thought out piece of apparatus. In small undertakings, when financial considerations unduly limit the number of tests, it is difficult to find a value for the average calorific value of the gas supplied; and if the number of tests is too small, there is a risk that the gas may, on the few occasions of test, be caught at an unhappy moment when it is in a state of depression. As Prof. Boys points out, tests at such times may not be balanced by others more favourable, with the result that the average calorific value reported may be less than that actually supplied. It is not possible to remedy this state of affairs, because the cost of the tests becomes an item in the local rates. As it is, it is only too often found that the limited number is considered excessive by the local authority. The consequence of all this is that small gasworks have to provide gas which on the whole is of better value than that actually declared, if they wish to be safe from adverse report. It is to reduce this hardship that Prof. Boys has brought forward his simplified testing appliances. This, however, is not all. He indicates a further possibility of obtaining a fair average value by a method of sampling, and suggests that in small country places the gas should be slowly and continuously drawn into a small holder in the testing place, and that the gas examiner should make a test on the gas which should be an approximate average of all that has been delivered since his last test. This suggestion will doubtless be well received by the gas industry. The final portion of Prof. Boys' paper is a description of a special gasholder for this purpose. If this system should work out well, the more important object of the Gas Regulation Act would be attained—and this for the smallest place and at the minimum cost.

Comments on the Paper.

As was to be expected, there were many appreciative remarks on the skill and ingenuity which Prof. Boys had exercised in bringing his ideas to a practical issue. Mr. Whipple, of the Cambridge Scientific Instrument Company, who remarked that the invention was characterized by simplicity, was impressed by the manner in which Prof. Boys had circumvented insulation difficulties. To his query whether Prof. Boys had tried diatomaceous earth as an insulating medium, he received the reply that this substance, though, of course, well known to the inventor, had not been used. The insulating material employed, cork, is entirely safeguarded from the effects of moisture. Prof. Cobb added his unqualified appreciation of the work done by Prof. Boys, at whose hands, he said, complex questions received simple solution. Dr. Colman, Dr. Parker, and Mr. Wood all referred to the question of deterioration of the gas on standing for a lengthy period over water. Dr. Parker wondered whether this difficulty could be overcome, at reasonable expense, by the use of a mercury seal, and made a most interesting observation to the effect that the gas might diffuse through the water lute, and eventually find its way to the atmosphere. Regarding this, Prof. Boys thought the rate of diffusion would be very low, and mentioned that after gas had been stored in the sampling holder for a fortnight no change had taken place. Mr. Wood, on the same question, suggested that, as a result of polymerization of certain of the compounds in the gas, it was conceivable that a solvent would settle on the water. Dr.

Colman drew attention to experiments which he had conducted, and said that in a holder similar to that of Prof. Boys he had never been able to find a definite loss greater than about 1 p.ct. His tests, however, were insufficient to constitute proof; and he suggested that the problem should be thoroughly investigated. Mr. Wood asked what provision was made for preventing the holder from being filled too quickly, and how the contents could be "backed-out" if the supply failed. Prof. Boys, in reply to this, said that the rate of filling was entirely governed by the clockwork mechanism, and, by a clutch device, "backing-out" was allowed for. Part of the discussion centred on the method of arriving at an average sample of the gas made or sold, and whether synchronization of an accurate nature was possible—Prof. Boys intimating that practical consideration should dominate, and that absolute perfection could not be gained, even by incorporating "Heath-Robinsonian" notions; Dr. Smith received confirmation of his suggestion that the apparatus would be suitable for both large and small works. The discussion was greatly enjoyed by a crowded meeting.

This concluded the afternoon sitting on Wednesday. The following morning two highly important papers and discussions occupied the greater part of the sitting.

Town Gas for Motive Power.

A contribution from Sir Dugald Clerk, K.B.E., D.Sc., F.R.S., Past-President and Honorary Member of the Institution, is always particularly welcome; and the short paper on the above subject which he presented was fully optimistic and most encouraging. Town gas for engines has deservedly been more in the limelight during the past year; but few realize that the proportion of that commodity used for motive power in Great Britain and Ireland amounts at present to about 10 p.ct. of the total make, and produces one-half the brake horse-power of all the internal combustion engines in our factories. Sir Dugald looks forward to a continued increase as external, and so internal, trade recovers from the cataclysm of the war. But all must do something towards this recovery, as we heard from the lips of Sir Philip Cunliffe Lister and Mr. Milne Watson last week; and every effort should be made to reduce the price of town gas for power purposes—4d. to 6d. per therm is too high to compete with other sources of power above 100 B.H.P. From 5 to 100 B.H.P., however, one great point in favour of the town-gas engine is that the efficiency remains practically constant under varying loads. The comparative cost figures, given in the paper, for various sources of power, including interest and depreciation, water, oil, and labour, are: Town gas, 0·75d. per B.H.P.-hour; anthracite (suction gas), 0·52d.; coke (producer gas), 0·49d.; and Diesel oil, 0·47d. For electricity, allowing 90 p.ct. motor efficiency, Sir Dugald prescribes a price up to 1·125d. per unit in order to compete for power.

Towards the end of the paper, the gas industry is strongly urged to push forward in this field. Gas undertakings must bring pressure to bear equal to that of their competitors; and the opinion is voiced that even the very small power trade might be held if the engines were let on hire. The gas industry has an excellent example in this direction from the President and the Derby Gas Light and Coke Company. Sir Dugald saw in the Gas Regulation Act the chance of varying methods of manufacture so as to supply a gas equally suited for lighting, heating, and power purposes; and with the same broad view he calls upon gas engineers to study the whole subject of fuels—not only town gas—for he looks forward to the discovery of further useful carbonaceous material in the wilder countries of the earth.

Further Encouragement.

It was doubly appropriate that the President should open the discussion on the above-mentioned paper, for the Derby Gas Light and Coke Company are really showing the way to the development of the power load. Mr. Bell stressed the advisability of regularly inspecting and indicating engines on the district. It is well known that he advocates free fixing and hire-purchase and simple hire terms. While not in favour of pushing differential prices to extremes, he considers that power tariffs should be cut as far as possible; and he would like to see the larger undertakings co-operating with the smaller ones in providing an expert inspector and adviser. At Derby it pays well to have such a man canvassing the district.

Mr. George Helps confessed that he had lost business to oil because he could not sell the gas therm for 3d.; and Mr. P. D. Walmsley introduced the subject of generating electricity by gas so as to counter the business our competitors do with the "individual drive." Mr. Samuel Shadbolt complained of such practice by the electricians as charging, through a special arrangement of bulk supply, from 0·75d. to 0·9d. per unit for power and 6d. a unit flat rate to shopkeepers for lighting on the same district. This is certainly drawing a very long bow (which might break one day); but Dr. E. W. Smith looks a hard fact in the face, and suggests an inquiry by the gas industry to determine the practical means of differentiating gas charges.

Mr. Tookey contributed several useful points. It was good to hear that many who introduced suction-gas plants when the latter came into vogue were now abandoning them in favour of town gas; also to learn of a manufacturer who finds it cheaper to run three small gas engines—theoretically inefficiently—than to take current from the public mains. Further, to have one's own gas-driven generating plant is a safeguard against strikes outside; but a client should be given a proper maintenance service.

We commend to all the verbatim report of the discussion; it will repay careful consideration, and there is much of encouragement therein.

Economics of Gas Production.

The paper by Mr. George Evetts is characterized by common-sense—a quality which is, perhaps, of all qualities the most difficult to attain, and which is the outcome of hard thinking and a broad outlook. The keynote of the paper, the subject matter of which constitutes a striking refutation to the claims of those who, without considering ultimate effects, point unhesitatingly to this or that means of salvation in the gas industry, is "it all depends." Mr. Evetts points out that calculations based on the volume of gas or the tonnage of coal are only useful in so far as they deal with the plant or machinery handling such volume or tonnage, and to this extent affect the working costs. Finally all results and costs must be reduced to the therm. How often do we hear of Chairmen of Committees congratulating themselves that they have made more cubic feet of gas per ton of coal carbonized than they did in a previous year—a statement which, without qualification, signifies nothing. Many discussions have taken place on the variation in the volumetric sale due to changes in calorific value, and statements have been made to the effect that consumers have used the same volume of low-grade gas, compared with corresponding periods when a higher grade was supplied. Mr. Evetts is of opinion that these statements would not bear investigation, and that volumetric consumption increases as the calorific value decreases. He quotes an example. The calorific value was 540 in 1913, and 375 in 1921. The sale in the meantime had increased by 50 p.ct. In other words, 540 therms in 1913 had risen to 565 in 1921, and the thermal sale per consumer was practically unaltered.

The basis of all calculations is the demand for thermal units; but the gas-maker cannot dissociate volume from his considerations. Exhausters, washers, purifiers, holders, &c., are limited in regard to volume. For this reason, though a low-grade gas may be cheaper to produce in the retort house, it may be dearer to sell. Taking gasholders as a case for comparison, assume that the maximum daily demand is 10,000 therms (1·82 million c.ft. of 550 gas). Gasholder storage of 1,600,000 c.ft. would represent 88 p.ct. of the maximum day. If the quality were lowered to 400 B.Th.U., the thermal storage would be reduced to 64 p.ct. of the maximum. To reach 88 p.ct., as before, additional storage of 600,000 c.ft. would be necessary—costing about £15,000. This would add 1·4d. per therm to the capital cost per therm sold per annum (based on 250 maximum days per annum).

Then there is the capacity of the distribution system to consider. Advocates of low-grade gas argue that distribution difficulties can be solved by increasing the pressure at the works; but, as Mr. Evetts emphasizes, the

fact remains that with a higher quality the increased pressure would deal with still more gas, so that a main of given size has a reserve of potential power if the calorific value is increased. Already in many cases gas undertakings have a stiff task in supplying consumers' needs; and this point should be borne in mind. It is shown in the paper that, taking an 18-in. main, 3600 yards long, 166 therms per hour are delivered with a 2-in. pressure drop when a gas of 290 B.Th.U. is supplied, whereas, with a gas of 564 B.Th.U., 390 therms per hour is the delivery figure. Dealing with distribution, Mr. Evetts points to the advantage of erecting outlying holders.

Throughout the paper the author does not merely state opinions; he gives the why and wherefore of them, backing-up his arguments by statistics. He lays stress on the need for taking local conditions into account when adopting any policy, and shows how it may be better in certain circumstances to make 10,000 c.ft. of gas per ton rather than 12,000 c.ft. He demonstrates that the maximum production of gaseous therms per ton of coal is not always the cheapest method of manufacture. With regard to the maintenance, repairs, and renewals of purifying plant, gasholders, &c., it is clear that a low-grade gas would necessitate a larger piece of plant in each case; and consequently fuel, oil, paint, and general attention would be more than in the case of a higher grade, and the costs of repairs and renewals would be greater. These points may appear obvious; but it is only too true that they are often taken into consideration after the event, rather than before. Speaking of leakage, Mr. Evetts says that it is probably unaffected by the grade of gas supplied. Low grade requires higher pressures, but a certain sized orifice would deliver no more thermal units in a definite time, for the increased volume lost would contain less heat units per cubic foot. The paper is full of useful and well-balanced observations; and it is hoped that these few notes will serve to indicate its general trend and its practical value.

THE NEW PRESIDENT.
Mr. C. F. Botley, of Hastings.

Low-Grade Gas.

In the course of the discussion which followed the reading of the paper, several interesting remarks were made by advocates of low-grade gas. Mr. Robinson quite rightly drew attention to the tendency to adjust calorific value in accordance with market conditions. When coke is good, it pays to distribute high-grade gas. At times when residuals fetch poor prices, the leaning is towards gas of a lower calorific value. But what about the consumer? Are these fluctuations either desirable or necessary? Mr. Robinson thinks the policy should be to reduce the amount of coal carbonized and coke produced, and thus attain greater stability. Mr. Shadbolt, of South Bank, on the question whether a cubic foot of 500 B.Th.U. gas performs the same duty as (say) 2 c.ft. of 250 gas, said that, though this might, and did, apply to power consumption, it was by no means so reliable where the domestic load was concerned. Mr. Shadbolt also referred to leakage. He considers that when Mr. Evetts states that a certain sized orifice will deliver no more thermal units in a certain time, as the increased volume lost due to higher pressures would contain less heat units per cubic foot, he assumes something which does not materialize in actual fact. Mr. Shadbolt has found in his area that an increase in pressure has been of assistance in keeping-down the figure for unaccounted-for gas—a remarkable experience. At South Bank, taking the calorific value now (400 B.Th.U.) and before the war (500 B.Th.U.), while the volumetric loss remains the same, the thermal loss has been reduced 27 p.ct. Mr. Marshall had a good deal to say about his low-temperature process, and suggested that low-temperature carbonization should be linked-up with gas-works practice, if success was to be assured. On this point Dr. Smith made the pithy observation that, if such a process is unattractive outside the gas industry, the industry will require a lot of convincing that its adoption would be worth while.

Official Advancement.

Then we heard the report of the Scrutineers upon the election of office-bearers, and new members of the Council. The expected happened. The members had the great pleasure of welcoming Mr. C. F. Botley as the successor of Mr. Ferguson Bell in the Presidential Chair; and an eloquent acknowledgment was made by our friend from Hastings. Mr. J. Wilkinson has been advanced from the Junior to the Senior Vice-Presidency. It is a happy procedure which allows a gradual stepping-up to the duties and responsibilities of the supreme office in the Institution, as it enables one to get thoroughly well-grounded in them. For the Junior Vice-Presidency, Wales has supplied a worthy successor to our Nottingham friend—Mr. H. D. Madden, the Engineer and General Manager of the Cardiff Gas Company. That long-experienced active worker in our organizations, Mr. W. E. Price, with that never-failing geniality of his, once more accepted the office of Hon. Secretary.

Thanks All Round.

Then the sittings concluded by richly expressed thanks to the President and Mrs. Bell—to the former for his work during the year and through the meeting, and to both for the magnificent hospitality and pleasure which they have given to the members. The Chairman and Directors of the Derby Gas Company were thanked for the great favours to come on the Friday. There was an "omnibus" resolution which thanked everybody who deserved such recognition; and then there was a special vote to that paragon of a Secretary, Mr. Walter T. Dunn, who, as we announced in last week's issue, starting as he did as a young man on the work, has now seen through thirty annual meetings for the Institution. And in his duties, those who are best qualified to judge certify that time increases his value. The President and the Council of the Institution of Civil Engineers were very cordially thanked for their generosity in placing so much of their fine building at disposal for this meeting, the proceedings at which had been of such varied interest and of such excellent quality.

In the afternoon of Thursday visits were paid to the Fulham Gas-Works of the Gas Light and Coke Company, the Laboratories of the South Metropolitan Gas Company, and the National Physical Laboratory; and on Friday to Derby. These are items in the programme which are dealt with in special descriptive accounts elsewhere.

GENERAL REPORT.

The Annual General Meeting of the Institution was held on Tuesday, Wednesday, and Thursday of last week, June 9 to 11, in the Great Hall of the Institution of Civil Engineers, Great George Street, Westminster, S.W., under the Presidency of Mr. J. Ferguson Bell, M.Inst.C.E., Chief Engineer and General Manager to the Derby Gas Light and Coke Company. He was supported on the platform by many gentlemen who are known personally or by name to everyone connected with the gas industry.

Welcome to Distinguished Visitors.

The President (who was loudly applauded on rising) said: Ladies and gentlemen, I am delighted to see so many present at our opening meeting this morning, and regard it as auguring a good and successful gathering. Before we commence the ordinary proceedings, I am sure you would like me, on your behalf, to offer a very cordial welcome to the many distinguished visitors who have been good enough to accompany me on to the platform. Not only have we visitors from New York, Australia, New Zealand, the Continent, and other parts, but we have also honouring us with their presence gentlemen here who are eminent in various spheres at home. I can assure them that we very heartily appreciate the signal honour they have done us in coming to this meeting. The industry which the Institution represents is one of the largest and the most important of our public utility services; and we are glad to find these gentlemen agree with us that it deserves encouragement. The capital invested in the gas industry and allied trades is something over £200,000,000 sterling; and it gives practically permanent employment to somewhere about 125,000 men. In these days of unemployment the latter is, I think, a most important factor. ["Hear, hear."] We are specially honoured this morning by the presence of my friend Mr. W. Woolley, the Chairman of the Derby Gas Light and Coke Company. Mr. Woolley is well known in Derby, and takes a great interest in all that concerns the Company over which he presides. I should like to take this opportunity of thanking him for all his assistance and the very valuable advice he has given me during the last twelve months. I was also expecting to see on the platform both the Members of Parliament for Derby; but the Right Hon. J. H. Thomas has evidently been delayed. We are glad to have with us the Lord Mayor of Manchester and the Mayor of Halifax. It is a real pleasure to me on your behalf to offer all these gentlemen a very hearty welcome. I will not occupy your time by going over all the names. Before we get on with the business, I will ask Mr. Woolley to say just one or two words.

Mr. William Woolley: I am very pleased indeed to come here this morning, because I feel that, in electing Mr. Bell your President, you have not only conferred upon him an honour which he so well deserves, but you have honoured the Company he serves, and has served so well for many years. I feel sure under his Presidency you will have a most successful meeting. I trust when your labours are over under his guidance, I shall have the pleasure of seeing nearly all of you at Derby on Friday.

Mond Scheme of Maintenance with Work.

The President: I will now ask Sir Alfred Mond, whom we are delighted to have with us, to address you. Sir Alfred Mond is known, not only as a prominent politician, but as a scientist and a successful industrial magnate—with a lot more of whom the country could very well do. In putting forward his attractive proposals for subsidizing employment, he has performed a great public service. The obvious advantages of maintenance with work over maintenance without work are now recognized by all parties; and we shall therefore be interested to hear what he may have to say on the subject.

Sir Alfred Mond, M.P.: I feel very honoured that I have been asked to address a few words this morning to such a very important gathering; and I will, in the first instance, say how relieved I am to hear your President state that we want a few more successful industrialists in this country. When I think of all the criticism we get to-day for success [Laughter], and of the abuse we suffer from if we show any profits at all, I sometimes wonder whether I do not belong to the criminal classes of this country. [Renewed laughter.] I once said that the only meritorious method of carrying on a modern business seems to be either in liquidation or in the Bankruptcy Court. At any rate, as soon as somebody makes any kind of success, he is denounced either as an exploiter or a profiteer; and that is a very discouraging atmosphere, I frankly must say, to all of us who are engaged in the very difficult and anxious task of endeavouring to maintain British industry under present conditions. I do not think the outside world at all realizes the anxiety and the work that is involved in conducting modern industrial enterprises. You have not merely to watch one country, or home competition, but you have to watch to-day the inventions of the entire world. Competition is now arising in quarters as remote as the Far East; and new ideas which you have to examine are being put into operation by able technicians of all countries. The task to-day is a thousand times more difficult than it was even fifty years ago; and there is another point that is not adequately realized—that no civilized country to-day has got any monopoly of technical efficiency, capital, or trained labour. Therefore, the task has become infinitely more difficult, and we who have been used to considering that the world existed in order to buy our exports, and to buy what we chose to send, now find ourselves faced with a world situation in which it becomes more and more difficult to induce people to buy our goods; while the war has produced national industries in countries often very little fitted to carry them out. At the same time these industries, once they have come into existence, will not be allowed to drop out. Therefore, you have this additional difficulty of restriction, I might say, of our export endeavour. We have succeeded in maintaining a magnificent currency and credit, combined with bad trade and unemployment unequalled in any country in Europe; but I do not think it is always recognized that the interests of high finance and the interests of business are not necessarily identical. Some people look at this country as a country which exists for the purpose of granting foreign credits; but I am in the habit of regarding it as one which has got to employ some 14 or 15 million workmen. It is these divergences of standpoints which make us industrialists not always agree with the pundits of high finance as to what is in the best interests of the country.

I have had to devote during the last few years, both officially and unofficially, a good deal of time to this problem of unemployment. Many of you know that in Mr. Lloyd George's Administration I was Chairman of the Cabinet Unemployment Committee for some two years. Most of the measures of alleviation which have been put into practice, such as trade facilities, export credits, grants to local authorities, and a number of other things, are really the fruits of the labour of that Committee, and have been continued ever since; but there is one thing when you come to work at this problem in detail which everybody finds—that the creation of artificial work is both costly and difficult. You can induce local authorities to dig useless ponds and fill them up again; you can have quite good schemes for the reclamation of land, and things of that kind; but there are great difficulties and cost involved in getting your raw materials on to the spot which makes the total cost of such schemes prohibitive. Another point not fully appreciated is the large amount of capital required in any industry to employ one workman. When you come to work out some of these

schemes, the difficulties are really very great. Therefore, my mind has always been turned to the problem: Why cannot we employ an unemployed workmen, not on the making of roads or in the reclamation of the Wash, but in the factory in which he is usually employed, which requires no new organization, and no displacement of the economic method of giving a man the job he needs in the factory he is used to, where the capital has already been expended and is lying idle? Obviously, if you can, you will save money by obtaining greater value in the way of increased production, and at the same time you are rendering a much greater service to the man in question. Why are industries depressed? We are experiencing difficulties in exporting and in selling goods abroad; and to what is that due? It is due to the fact that our prices are too high for the purchasers. There are two reasons for this. Exchange is one. Then, as we all know, the poverty produced by the war in the world is another; and the question is, How can we bridge the gap between what I might call cost of production and purchasing capacity—not demand, because the demand is there all right? That, to my mind, is the fundamental problem; and that gap is not always so wide as people imagine. I have had case after case illustrating this. I had a case in shipbuilding recently, in which the Chairman in this country of a very large American undertaking had some ships to place; and we were in competition with, of all people, the French. The difference between the British and the French tenders was not very big. On one tank steamer of considerable size there was, perhaps, a difference of £30,000.

Now, at the same moment that you hear of an order which you could get for that difference, you see, on the other hand, thousands of unemployed walking about the streets, and being paid from 18s. to 23s. a week for doing nothing at all. You are spending £100,000,000 a year in the country by paying something like a million of people for doing nothing; and really I cannot understand a business nation going on doing that. Since the war, you have spent more than £300,000,000 in cash, for which you have not one penny in assets. It has all been spent on unemployment relief; and therefore it is that I ask why we cannot in some way marry this sum now being paid in unemployment relief with the cost of production. By enabling our cost of production to be reduced, we can obtain more work. That is the problem in a few words; and I have devoted a great deal of time and thought to a method by which this can be done. I do not say that you can work out in advance every possible detail; but I think I have worked out the scheme in sufficient detail to say that it is practicable. It is based on three or four very simple considerations. First, it involves the surrender of the unemployment allowance as a voluntary matter on the part of the workman, because I think it would be fatal, when a man is entitled to an unemployment allowance, to pass any legislation which would take away from any individual person anything to which he is entitled. Secondly, you must get more people employed than is the case at present; and you must make it impossible for any employer to substitute a man who is employed to-day in the ordinary way by what I might call a man subsidized by unemployment relief. I think my scheme is absolutely watertight on that point. Therefore you are not merely substituting employment in one factory for unemployment in another; and it is for that purpose that I have created somewhat elaborate machinery in the form of trade committees, whose functions will be to watch three cardinal points. Any employer who applied for permission to enable him to obtain what I might call a workman with his unemployment allowance would have to prove to the trade committee that the contract he wanted to take was new work, and that he would not be taking away work from another factory. Many people think that is very difficult; but in the kind of industry which I have visualized, like engineering—of which I know a good deal, because I have been Chairman and Director of engineering firms—and shipbuilding and big industries of that kind, and even the gas industry, it is not so difficult. Let me give you a particular instance. I am interested, as I dare say a good many of you know, in a firm which has done a great deal of work in the gas industry, Messrs. Ashmore, Benson, Pease. We have got some contracts for big gasholders in Canada. It would be easy for a firm like this or any similar firm to show that, if a contract in competition with America or Belgium or any other country, could be obtained on certain terms, we could employ so many more men than we are employing to-day. I am always being told that all I am doing is to transfer a contract from works B, which is less efficient, to works A, which is more efficient; but my answer to that is that what I am doing is to get the contract for works C, and that under present conditions works A and B would never get the contract. If, therefore, works C gets this work, you obtain very much more work and more employment. My scheme is designed admittedly to enable us to help works C. It would also apply to any local authority and to any public utility undertaking with limited dividends under an Act of Parliament, like a gas company. Any company like this would be able to take on more men; and as you are taking away nothing from anybody, you are simply extending business. Indeed, I have had letters from engineers of gas companies saying that they would be able to employ more people and extend their undertakings immediately if my scheme were in operation. What does the scheme amount to? It would mean a wage reduction by the amount of the subsidy during the time of the employment, but not a wage reduction to the workman. He would have to be paid at the usual district union rates. He would not be paid a penny less, and he would have to be engaged for a reasonable period. His position would be entirely safeguarded, and instead of the Unemployment Fund paying money to men who are not engaged in any work at all, and giving these men the inadequate and miserable pittance which they receive to-day, and which is often supplemented by the Poor Law Guardians, the men would be earning £3 or £4 a week. Now what would happen if this state of things came about? As soon as you put people back to work, and pay them decent wages, they become consumers; and by doing this they help other industries which are not in the scheme at all, and produce employment in these other industries. The moment you start employment anywhere, you get ancillary employment in hundreds and thousands of directions, and you get a reduction in employment of a very considerable size. I was interested to learn only yesterday that the Swiss Government have anticipated my idea by three years. The Swiss watch industry, which was a big export industry, was almost ruined, because, though the Swiss had a good exchange, they had to sell to countries with a bad exchange. The Government had to do something, and they did not sit down and say there was nothing to be done. They worked out a scheme, not exactly in the same detail as mine, but on the lines of subsidizing the watch industry as regards those countries where the currency was depressed. In one year they reduced the unemployment in the industry by one-half, and at the same time they reduced the general unemployment in the country to a considerable degree. It is very interesting to find that an idea of this kind has been put into practice by a small but intensely hard-headed and practical nation such as the Swiss, and has proved that the results which I have deduced would occur have actually occurred. Personally, I cannot understand the timidity of those responsible for our Government which prevents an effort to start a scheme of this kind. I am perfectly well aware that there will be difficulties, and that there will be complaints. There will always be difficulties, and there will always be complaints; and you will never get everything perfect. That has never been done in the history of the world. But in considering a scheme of this kind, surely, when you have got to a condition almost of stagnation in the unemployment of one million people, when you see the devastating results it is having on the efficiency of the workers in this country, when we know that a great many of our best workers have left, and others will continue to leave, these shores, it is time that timidity and hesitation are put aside, and audacity and enterprise substituted. People who know nothing about works and workmen have curious ideas. They seem to think that you can keep both idle, and, when trade improves, suddenly start up to 100 p.ct. efficiency, as if nothing had

happened. All of us who have to carry on works, however, know that is not true. We all know that, if a works is shut down, an extraordinary deterioration takes place, even with the greatest care. We know that staffs, once dispersed, are extraordinarily difficult to re-create. We know that if the best skilled workmen have gone to America they are not coming back just because we want to give them a job. What I fear is that, if industry does improve, we shall find we are not in the position of having the means of meeting it unless, in the interval of depression, we have enough foresight to keep our men in a state of efficiency. After all, we have an army in peace time to defend our country, and that army is highly trained, in order to operate on those unusual and rare occurrences when war takes place. I wonder what any member of the General Staff would say if I suggested to him that it was not necessary to worry about drill or musketry or manœuvres or anything else in peace time, and that these things could be thought of when the occasion arose. The industrial army, in a sense, must be quite as efficient as the military army, and your reserves must also be kept in a condition of efficiency, so that when you want to mobilize them they can operate. What we are doing also is to deteriorate the efficiency of the men at the other end. I mean that we have hundreds and thousands of men who have been trained for nothing, and year after year are becoming absolutely useless. When these men were wanted to fight for the country, there was nothing in the world we were not prepared to do for them. Anybody who likes to go back to that period will see what we said then. Many of these were young men who went straight into the army, and could not be apprenticed and learn any business; and it is a perfect outrage that they have been allowed to walk the streets year after year since. I say it is a national shame that nothing has been done for them.

Therefore, I want this project of mine looked at not merely from the economic standpoint, although there I think it is sound, and still less from the standpoint of the private individual and private interest and private profits, but from the broad fundamental national outlook of the country. The responsible people in this country have got to ask themselves one simple question—how far can we go on as we are to-day? Can we go on any longer? And if we cannot, is there anybody who can put forward a better than the scheme I have outlined, a more practical scheme, and one more likely to achieve results? That is what I want an answer to. If there is a better scheme, let us have it; if there is not, let us proceed with this one. Of one thing I am certain, and that is—you cannot afford to go on as you are doing now, sitting still waiting on events, and hoping that something is going to happen. That is the most dangerous and disastrous policy which this country can adopt on this question. [Applause.]

The President: By your applause, you indicate how greatly you appreciate the splendid address that Sir Alfred Mond has been good enough to give us on a subject which is probably the most important that this country has now to consider—namely, unemployment. I will ask the Secretary to read out the names of some of our distinguished visitors, so that members may know who are on the platform, because it is impossible for me to ask each one of them to address you.

Names of Distinguished Visitors and Overseas Members.

The Secretary (Mr. Walter T. Dunn, M.I.Mech.E.) read the following list of distinguished visitors and members from overseas:

Sir Alfred Mond, M.P.
Mr. Wm. Woolley, Chairman of the Derby Gas Light and Coke Company.
M. Baril, Société Technique de l'Industrie du Gaz en France.
M. Victor Timmerman, Secretary, Belgian Association of Gas Engineers.
Mr. H. Zollikofer, Secretary, Swiss Association of Gas and Water Engineers.
Mr. John C. Irminger, Bergen, Norway.
Mr. J. G. Tooms, Oslo.
Mr. T. O. Morland, Sydney.
Mr. C. F. Snelgrove, Calcutta.
Mr. Stanley B. Johnson (Colombo).

The President: Mr. Zollikofer will say a word or two on behalf of the foreign delegates.

Mr. H. Zollikofer: I thank you on behalf of the foreign delegates for your kind invitation to this meeting; and I wish to convey to you their best wishes for the full success of the gathering. I consider it a great honour to the Swiss Association of Gas and Water Engineers that they should have been invited to the annual meeting of your Institution; and I regard it as a privilege, as well as a pleasure, to represent them. Our President desires me to convey to you the expression of his great regret that he should have been prevented from attending this meeting. As delegate of the Society, I should like to present to the Institution of Gas Engineers an expression of the sympathy and friendship of the Swiss Gas Engineers. It will be a pleasure to me to inform our members in Switzerland of the kind reception I have had here. I wish the British gas industry every prosperity and success in its future development. I wish also to express my admiration of the great effort you have made at Wembley, in showing what the gas industry can do over the whole world. My congratulations are offered to you on the great success of this effort.

Good Wishes.

The President: The following telegram has been received from the Société Technique de l'Industrie du Gaz en France:—

> Au nom Société Technique de l' Industrie Gaz en France nous envoyons meilleurs vœux pour pleine réussite votre meeting avec assurance sentiments sympathie cordiale que notre délégué Monsieur Baril vous apportera.—Le Président, Rolland D'Estape.
>
> [Translation: The Société Technique sends you best wishes for the complete success of your meeting and assurance of the cordial feeling which our delegate, M. Baril, conveys.]

I now wish to suggest that the Secretary should send a cablegram in the following terms to His Royal Highness the Prince of Wales as an honorary life member of this Institution:—

> The Institution of Gas Engineers, at annual meeting in London, send loyal greetings, and wish you continued success in your tour.—Ferguson Bell, President.

I am quite sure I shall not have to put this to the meeting; it will receive your unanimous approval. [Applause.]

Confirmation of Minutes

The President: I now have to move that the minutes of the last meeting be taken as read and confirmed.

Mr. C. F. Botley (Hastings): I have pleasure in seconding that. ["Agreed."]

New Honorary Members.

The President: The next pleasant duty I have to perform is to nominate several gentlemen as honorary members of the Institution. The first name on the list is that of Mr. Charles Hunt, M.Inst.C.E. I have a letter, received yesterday, from Mr. Hunt, in which he says how much he regrets that he is unable to be with us at this meeting; and I am quite sure we equally regret his absence, and hope that he may be speedily restored to health. I am delighted to have on the platform to-day the Lord Mayor of Manchester, Alderman Fred. J. West; and I nominate him as an honorary member. In addition I propose the Presidents of the American, Belgian, Canadian, French, Italian, Norwegian, Swedish, and Swiss Gas Associations as honorary members of the Institution.

Mr. Botley: I scarcely think it needs any words of mine to commend these gentlemen to you. We appreciate very much the association with us of our foreign colleagues. I have very much pleasure in seconding the proposal.

The President: That is carried unanimously, and I will ask Alderman West to reply on behalf of the honorary members.

Alderman Fred. J. West: I find it difficult to choose suitable words in which to express my appreciation of the

great honour that has been conferred upon me by the Institution. I can well believe that in taking this step you desire to reflect in some way the great esteem and regard you had for my father ["Hear, hear"], who, as many of you know, was a Past-President of the old Gas Institute, and to whom you awarded the Gold Medal in 1918. I am also conscious of the fact that in my election to honorary membership you have been influenced by the importance of the civic position which I occupy at the present time; and I can wholeheartedly say that, at the conclusion of my Lord Mayoralty, nothing will give me greater satisfaction than to reflect upon the notice which has been taken by the gas industry of the civic work which I have been privileged to perform. When I do relinquish my present civic position, it will be as Fred. West that I shall hope to enjoy my honorary membership, and it will be in that capacity that I shall hope to retain the regard and good-fellowship of the members of the Institution and to continue to be of some service to the gas industry—thus marking the great honour you have done me to-day. [Applause.]

Appointment of Scrutineers.

The PRESIDENT: If it is agreeable to the members, I propose that Mr. J. W. Auchterlonie, of Cambridge, and Mr. Robert Watson, of Doncaster, be appointed Scrutineers of the balloting lists. ["Agreed."]

Dr. Carpenter and the Birmingham Medal.

Dr. Charles Carpenter was then invited to step up on to the platform, and was accorded a rousing welcome.

The PRESIDENT: Now a very pleasant duty falls upon me as President, and that is to ask Dr. Charles Carpenter to accept the Birmingham Medal. Your Council unanimously decided that this award should be made to Dr. Carpenter; and it is a source of satisfaction, I am sure, to them, as it is to me, that this decision of the Council has been unanimously agreed to by the Institution. This indicates, I think, a desire on the part of the Institution and of the industry for special recognition to be made of the outstanding services rendered over a long number of years by Dr. Carpenter, who occupies a foremost position in the industry. It affords me considerable pleasure to be the instrument to present the Birmingham Medal to one whose name will add lustre to the list of eminent men to whom the medal has been awarded. The medal was founded in 1881 by the Midland Association of Gas Engineers and Managers, to enable the gas industry to recognize merit and assiduity in connection with the manufacture and application of gas; and I know that I am voicing the opinion of all present when I say that no one has done more to improve the scientific manufacture of gas and its distribution than our good friend Dr. Carpenter, so that the recognition is richly deserved. Though it is 44 years since the Birmingham Medal was instituted, it has only been awarded upon ten occasions, which indicates the jealous care of the Institution in the matter of its bestowal. They are very desirous that it should be awarded to those who not only attain high position, but in other ways merit this distinction for their services to the industry. The first recipient, in 1882, was the late Sir George Livesey, who for many years was the recognized leader of the gas industry, a position which Dr. Carpenter now worthily occupies. As President of the South Metropolitan Gas Company, he has more than maintained the best traditions of that great public utility undertaking. Not only has he done that, but he has always been willing to place at the free disposal of the industry his great abilities and unrivalled technical experience, as well as to render assistance to anyone who may desire it. It is, I am sure, the sincere wish of the gas industry and of this Institution that Dr. Carpenter may be long spared to continue the work in which he is engaged. He is a shining example of what can be accomplished by assiduous industry, fixity of purpose, and capacity to control a large undertaking. I have the greatest pleasure, Dr. Carpenter, in asking you to accept this medal. [Applause.]

Dr. CHARLES CARPENTER: Mr. President and gentlemen, it is very difficult indeed to find words to express the thoughts and emotions with which my heart is charged on this, to me, unique occasion. It has been said that time only approves of those decisions with regard to which time has been consulted; and it is now seventeen years since I relinquished what claim I had (if any) as a justification for the magnificent eulogy which has been pronounced by Mr. Ferguson Bell to-day. It is seventeen years since I relinquished technical control for administration. I have always regarded it as a great sacrifice when I decided upon that change. I will not weary you this morning, because the President has already made one suggestion with reference to brevity, and I should be the last person to desire to transgress it. But by that change, while I have made sacrifices, I have, at any rate, been able to do what otherwise might have been withheld from me. Like your President, I have had before me the goal of the gas industry extended in efficiency and extended in its size. One of the advantages that one has in occupying a position associated with administration rather than the technicalities of gas supply, is that one can look on the various problems involved from a detached point of view; and I have endeavoured during all those years to which I have referred to take, as far as possible, full advantage of that fact. Unfortunately I have in many respects been limited. An all-important one has been the amount of energy I have been able to put into my work, and that seems to be a reducing rather than an increasing quantity.

There is one matter to which I would ask you, as engineers, specially to give your attention; and I was particularly reminded of it when I heard our friend the Lord

THE NEW BIRMINGHAM MEDALLIST.

Previous Recipients: 1882, Sir George Livesey; 1884, Frederick Siemens; 1886, Charles Hunt; 1890, Thomas Newbigging; 1892, Sir W. H. Perkin; 1894, William A. Valon; 1897, Baron von Welsbach; 1905, James W. Helps; 1913, Sir Corbet Woodall; 1918, John West.

Mayor of Manchester refer to the respect and admiration with which the gas industry regarded the work and the career of his great father. The matter I have in mind is the carbonization of coal. In the past, this has been too often looked upon as a process for the handling of raw material and its products. I feel sorely tempted to take up your time this morning by a more extended reference to that than I have now decided upon; and it would perhaps be wrong not to take this chance of saying two or three words with regard to that story. We turn back to those early days when the late Mr. John West was a pioneer in the endeavours to reduce or to eliminate the heavy, arduous work commonly carried out in the retort houses in those days, and we remember how his association with a gas undertaking as its manager and engineer gave him the opportunity of putting these ideas into practice. Now I venture to urge that this moral is a very important one. I see, I think, to-day too great a tendency on the part of the

industry to leave the development of the industry to outside sources, rather than take its problems in hand itself. I quite agree we want all the help possible from outside; but I think it is very important that we should not disregard our own duties as gas engineers in connection with the development of our industry as well. I heard, to my great surprise, the other day of a large undertaking that does not employ its own retort setters or bricklayers. Having regard to the important part played by the construction of the retort house in the economy and working of an undertaking, it does seem an extraordinary thing to me that this very essential part of the work of the concern should be placed in outside hands. I think the industry itself should develop itself, and I take the case of Mr. John West as an example of what has been done in that respect. His hand machines he developed at Maidstone, and then put power to them—I think at first compressed air. Then he built larger machines, operated by means of a steam boiler attached to each. For that he substituted the motive power of a steam or gas engine operating through the medium of a wire rope; and finally he went in for the use of compressed air for conveying energy from the engine room to the retort house.

One other matter on which I should like to say a word has reference to the complaints to-day on the part of the gas industry as to the undue preference which is being given by the Government to the transmission of energy by means of electricity. Well, I think that arises from a misconception on the part of the authorities. We must not blame them, because very few of them have the enormous advantage of the able man who spoke so admirably this morning, of a close association with industry—and with an industry which has a sound and solid foundation of scientific knowledge. Unfortunately men of that type are far too few in connection with our Governments. If that were not so, I cannot believe there would be such a tendency on the part of the authorities to support one form of transmission of energy in preference to aiding the development of a much more important one. ["Hear, hear."] But I do think, gentlemen, that you yourselves are not wholly free from, I was going to say, blame in that respect, because I have sometimes thought that you yourselves have forgotten that electricity is simply a means of transmission of energy, not of producing it, and that it is not the only one. If one requires to convert energy into rapid rotative force—as, for instance, in the De Brouwer charger—one can imagine an electric motor to be a very admirable piece of mechanism to do it; but for discharging a retort, what can be more simple than a hydraulic tube with a ram, into which you turn on, or from which you exhaust, water, as the case may be?

Some time ago I had an application from a firm to be allowed to quote for the large generating station which they felt sure we wanted in a large works like those at East Greenwich. I told them that neither at East Greenwich nor any other works of the Company had we got an electricity generating station at all; and it might have been suggested, as the result of this, that we got our electrical energy from some local authority. If I may take a few more minutes, I should like to tell you a little story, because it does point a moral with regard to this particular point. We have got an undertaking—one of the municipal undertakings I have referred to—which for 25 years has been doing its best to take the bread and butter out of our mouths, and it has been subsidized during most of that time by assistance from the rates. To-day it is in the fortunate position of being able to make both ends meet. But what has contributed to this result? It is the fact that a neighbouring gas undertaking, not content with being able to make its own "juice" by gas engines—as was pointed out many years ago by Mr. Denny Lane, although he was a nationalist—and not content with being able to do it by waste-heat boilers, took electrical energy from the municipal electricity department. Now, gentlemen, in face of these facts, I do think that in the matter of the transmission of power and the generation of power through the medium of the electric generator, some of you might, perhaps, look a little at home. I must not take up any more of your time except to thank you very heartily for the great honour you have done me. I know most of the gentlemen who have received this honour, from my friend Sir George Livesey—whom we all admired—down to the most recent, our friend Mr. Doig Gibb, for whom nothing golden is too good. I rejoice to think that to that number of distinguished gentlemen you have to-day been so good as to add my name.

Mr. George Helps (Nuneaton): I wish publicly to congratulate Dr. Carpenter, from the other end of the industry, on being the recipient of this medal.

[Mr. Helps was continuing to speak, when the President asked him to sit down.]

London Gold Medal.

The President: I will now ask Mr. Gibson to come forward. Mr. Gibson, it affords me the greatest possible pleasure to ask your acceptance of this London Gold Medal for your capable paper on "The Construction of New Coal Gas Works at Garston, Liverpool." Since you read that paper, by your courtesy I have been able to see these works; and I can only say that all that was stated in your paper is more than justified. The Liverpool Gas Company are to be congratulated on having an Engineer who is able to construct so admirable a works. I am sure we all congratulate you; and it is with the greatest possible pleasure that I ask you to accept this Gold Medal.

Mr. R. E. Gibson: I appreciate very much the honour you have conferred upon me in presenting me with the H. E. Jones Gold Medal for my paper last year; and I thank you, Mr. President, for the kind, and too generous, words you have spoken in making the presentation. Naturally it is to me a pleasure and a satisfaction that the paper I read was deemed worthy of this distinction, and I shall regard this Medal as one of my most valued possessions.

The Diplomas.

The President: The Secretary will now read the list of Diplomas in Gas Engineering awarded in 1925 under the Institution's Education Scheme.

The Secretary read the names as follows:

First Class.

Thomas Harold Prater, Southgate.

Second Class.

Charles Bateman, Cardiff.
Thomas Vincent Blake, Cardiff.
Thomas Dyson, Huddersfield.
Duncan Dewar Melvin, Glasgow.
Sydney Smith, Birkenhead.

The Diplomas were then presented by the President.

Lord Moulton Memorial.

The President: It is my pleasure now to propose that a sum of £100 be voted by the Institution as a donation to the Lord Moulton Memorial Fund. It will require few words of mine to commend this to your unanimous acceptation. We know that Lord Moulton, who was President of this Institution, was a great scientist, and did great work during the war. He it was who said it was the gas industry, by the contribution of its valuable products, which so materially helped to win the war. We are therefore glad to be associated with this memorial to him; and without further remarks, I will propose the resolution. Mr. Doig Gibb was associated with Lord Moulton, and perhaps he will second it.

Mr. W. Doig Gibb: I have great pleasure in seconding the proposal. It is up to us to do all the honour we can to the memory of so great a man.

The resolution was heartily agreed to.

The Gas Administrator to the Board of Trade.

The President: We are pleased to have with us now on the platform Mr. H. C. Honey, Director of Gas Administration at the Board of Trade. The work he has done is greatly appreciated by us. We do not always get all we want, but we are satisfied that we get a fair hearing.

The Presidential Address.

The President then delivered his address, which will be found on p. 863.

Dr. CARPENTER : We have had the privilege of listening this morning to two admirable and instructive addresses—each of them dealing with an important national matter; one unemployment and industry, and the other the utilization of our coal resources. As an Institution, we rely year by year upon our Presidents to place before us, and before the public, a vivid and realistic picture of the condition of the industry. That has been done this morning in a manner which compares most favourably with all past attempts in the same direction; and we are very much indebted to our President for the excellent way in which he has outlined what our industry can do for the nation, and emphasized the fact that it provides for the most scientific and the most economic utilization of our coal resources. I have very great pleasure in proposing that the hearty thanks of this meeting of the Institution of Gas Engineers be accorded Mr. Ferguson Bell for the admirable address he has given us this morning.

Mr. HENRY WOODALL : I rise with intense satisfaction to second the proposed vote of thanks to our President for his excellent address; and in doing so I should just like to refer for a moment to one little incident which occurred in 1913. Many of you will remember that in that year Mr. Ferguson Bell, in a very charming and graceful way, retired from the Presidency, which he might have taken, in order that my father, the late Sir Corbet Woodall, might act as President during our Jubilee year. I am sure that many of us very greatly appreciated that action. The next year Dr. Carpenter proposed, and my father seconded, the nomination of Mr. Ferguson Bell to the Presidential Chair; but he, for very good reasons, no doubt, felt unable to take the chair that year. We are only too glad to see that though he could not fill it then, he has been able to do so now. I wish that my father had been here to join again with Dr. Carpenter in appreciation of the services which our President has rendered. Last night I spent with my mother. She remembers with a great deal of pleasure meeting many of you gentlemen; and she said—I do not think it will be out of place, and I hope you will not so regard it—I might tell you that she also remembered Mr. Bell's graceful act, and was very glad to know that he had now become President, and was having such a successful year of office.

Dr. CARPENTER : The resolution is before you, and I will ask you to signify your acceptance of it in the usual cordial fashion.

This having been done,

The PRESIDENT said : I very greatly appreciate the all too flattering remarks that have been made by my friends Dr. Carpenter and Mr. Woodall. It is a great honour to me that the proposer and seconder of this vote of thanks should be gentlemen who are so deservedly respected in the gas industry. With regard to the remarks of the seconder, I am glad to know that Lady Woodall remembers us, and takes a kindly interest in our proceedings. On your behalf I shall ask Mr. Woodall to convey to his mother our thanks for her kind message. I have already spoken for nearly three-quarters of an hour, and will now only express my appreciation and my gratitude for all your kindness, and say again what a pleasure it is to me to be your President. I did not accept the nomination of my good friends Dr. Carpenter and Sir Corbet some twelve years ago, because I had not then the necessary health, and I certainly had not the experience which I have since acquired. Thus I do not think the Institution have lost anything by waiting. It is said that everything comes to him who knows how to wait. I waited; and I thank you now for having elected me President. I hope we shall have a very successful meeting.

Annual Report and Accounts.

[See "JOURNAL" for June 3, p. 662.]

The PRESIDENT : I will now move the adoption of the report of the Council for the year 1924-25, and the statement of accounts for the twelve months ended Dec. 31 last. You have all had the report in your hands for several weeks, and I do not think there is anything in it over which you would desire me to occupy your time.

Mr. J. D. SMITH, J.P. (Belfast) : I have much pleasure in seconding that.

The report and accounts were adopted without discussion.

Report of the Advisory Committee on Education.

The PRESIDENT : I will next ask our good friend Mr. F. W. Goodenough, the Chairman of the Advisory Committee on Education, to submit the report of that Committee. We are very much indebted to the Education Committee, and especially to the Chairman, for the great amount of work put into the scheme.

Mr. F. W. Goodenough then presented the report, which, with his statement, will be found on p. 877.

Thirteenth Report of the Investigation Committee.

Prof. J. W. COBB then introduced the Thirteenth Report of the Gas Investigation Committee on "Aeration in Atmospheric Burners, with Special Reference to Lighting Burners." Before doing so, he remarked : In the first place, I may say that I am quite sure you share the regret which is felt by the Research Committee and myself that this report is not introduced by Prof. Smithells, simply and solely because he has been suffering from severe illness—probably the only cause which could have prevented him being present on an occasion of this kind. However, I had a letter only yesterday morning, in which he assures me that his progress towards health and strength is entirely satisfactory. This I have no doubt everybody present will be pleased to hear.

The PRESIDENT : I have a letter from Prof. Smithells in which he says :

> I am writing to say how very sorry I am that I shall not be present at the forthcoming meetings of the Institution. I have got a long way on the path of recovery from my recent troubles; but I am forbidden for a little while yet to attend meetings.
>
> It is a very great disappointment to me that I cannot attend. The programme is most alluring; and it would have been a great pleasure to me to be present to hear your address, to see honour bestowed so worthily on Dr. Carpenter, and to share in what I am sure will be an exceptionally interesting meeting. I need hardly offer my wishes for its success.

I am sure we are all very sorry he is not able to come, but we are delighted to know that he is well on the path to recovery.

Mr. J. W. WOOD summarized the report, which, with Prof. Cobb's introduction, will be found on p. 879.

Fourteenth Report of the Investigation Committee.

Prof. COBB then presented, and Dr. Parker summarized, the Fourteenth Report of the Gas Investigation Committee, on Corbet Woodall Experimental Gas Plant Carbonization Trials at the Leeds University—see p. 898.

Handsome Donation to the Benevolent Fund.

The PRESIDENT : I have a very pleasant message to give you which has just been handed to me. The Lord Mayor of Manchester says : "I propose to contribute £100 towards the Benevolent Fund, which I suggest should be invested so as to bring in an income of £5 per annum." We very much appreciate this kindly thought on the part of one of the latest of our honorary members.

More Good Wishes.

The PRESIDENT : Before we settle down to the afternoon's business, you will be very glad to know of the receipt of a cablegram from Mr. M'Lusky, of Glasgow, who is in America, sending : "Best wishes for a successful meeting."

The Tankless Gasholder.

The PRESIDENT : The first paper on our programme is entitled "The Tankless Gasholder at the Etablissements Arbel, Douai, France," by M. Rolland d'Estape, President of the Société Technique de l'Industrie du Gaz

en France. Unfortunately, M. d'Estape is unable to be here this afternoon; but M. Baril has undertaken to read it for him. We very much appreciate a paper from France on a subject which must be of great interest and importance to all gas engineers.

The paper, with a report of the discussion, will be found on p. 911.

Numerous questions were put to M. Baril, and to them that gentleman replied in French—Mr. Zollikofer kindly undertaking the duty of interpreter.

Carbonizing Plant at Stretford.

The first day's proceedings closed with a paper by Mr. W. M. Carr on "The Selection, Design, and Construction of New Carbonizing Plant at Stretford." This and the discussion appear on p. 915.

The Benevolent Fund.

Wednesday morning's session opened with the Annual General Meeting of the Benevolent Fund (see p. 876).

Additions to the Roll of Members.

The Secretary announced the following additions to the membership roll; and those of the newly elected who were present were introduced to the meeting:

Members.

Anderson, George Edwin, Works Manager, Howdon Works, Newcastle-on-Tyne.
Ashworth, Richard, Engineer, Manager and Secretary, Tamworth Gas-Works.
Atkinson, Richard Littledale, Assistant Manager, Elswick Gas-Works, Newcastle-on-Tyne.
Barnard, Robert Henry, Manager and Secretary, Gas-Works, Wantage.
Beveridge, James Wilson, Engineer and Manager, Gas-Works, Troon, Ayrshire.
Birchmore, Leonard, Engineer and Manager, Louth Gas-Works.
Birks, Falconer Moffat, O.B.E., Mechanical Engineer, Gas-Works, Beckton.
Breaks, Christopher, Engineer and Manager, Ellesmere Port Gas-Works.
Calderwood, Robert John, Gas and Water Engineer and Manager to Spalding U.D.C.
Dean, Harry Watson, Engineer and Manager, Padiham U.D.C. Gas Department.
Dearden, Walter Armitage, Engineer and Manager, Gas Department, Johnstone, Renfrewshire.
Demain, John, Engineer and Manager, Ripon Gas-Works.
Dixon, James Edward, Works Manager, Elswick Gas-Works, Newcastle-on-Tyne.
Greenough, Peter, Gas and Water Engineer, Hindley.
Perks, George Watson, Chief Chemist, Stockton-on-Tees Gas-Works.
Reid, Norman, Manager of Redheugh Gas-Works, Newcastle-on-Tyne.
Robertshaw, Walter Livesey, Works Manager of the Ayre's Quay Works of the Sunderland Gas Company.
Sahlberg, Hans Ferdinard, Director of the Helsingfors Municipal Gas-Works.
Sato, Kenji, Manager of the Omori Gas-Works of the Tokio Gas Company.
Surtees, Gilbert, Engineer and Manager, Uttoxeter Gas-Works.
Watson, Alfred Thomas, Engineer and Manager, Rushden and Higham Ferrers District Gas-Works.
Whatley, Greville John, Assistant to F. H. Jones, Consulting Gas Engineer, London.

Associate Members.

Alexander, Anthony Parker, Engineering Assistant at South Bank Gas-Works.
Bell, William, Second Assistant to Engineer and Manager, Reading Gas Company.
*Bengough, Francis John, Junior Engineer, Nechells Works, Birmingham Gas Department.
Birch, Ernest, Assistant Distribution Superintendent, Stockton-on-Tees Gas Department.
*Carmichael, Stanley, Works Chemist, Avon Street Gas-Works, Bristol.
Cleator, James Radcliffe, Senior Assistant, South Bank Gas-Works.
*Cowles, Harold Austin, Coal Test Works Shift Chemist, Nechells Works, Birmingham Gas Department.
Cox, Spencer H., Assistant Works Manager, Haywards Heath District Gas Company.
*Dupont, Fernand, Chief Assistant Engineer, Neath Gas Department.
Ely, Robert John, Assistant Manager to the Ridding District Gas Company.
Fall, Frederick Percy, Engineering Assistant and Chief Draughtsman, Sunderland Gas Company.
Hart, Edward Holford, Works Chemist, Romford Gas and Coke Company.
Kimpster, William Corbitt, Technical Assistant, Newcastle and Gateshead Gas Company.
*Mortimer, Thomas Rayner, Assistant Engineer and Manager, Brighouse Gas Department.
Nicholls, Frederick, Chemist, Redheugh Gas-Works, Newcastle-on-Tyne.
*Parrett, Jack, Technical Assistant, Exeter Gas Light and Coke Company.
*Prater, Thomas Harold, Chemist to the Tottenham and District Light, Heat, and Power Company.
*Preston, Joe Bray, Technical Assistant, Spenborough Urban District Council Gas Department.
Rioch, John Hunter, Assistant Engineer, and Manager, Gas Department, Inverness.
Robson, Colin, Technical and Chemist Assistant, Elswick Gas-Works, Newcastle and Gateshead Gas Company.
Sheehan, Patrick Joseph, Assistant Engineer, Cork Gas-Works.
Summerson, Roy, Chief Chemist and Junior Assistant at the Gas-Works, Luton.
Williams, Samuel James Downing, Assistant Engineer, Gas-Works, Stourbridge.
*Winch, Egbert Harold, Second Assistant, Cambridge University and Town Gas Light Company.
Woodfine, Cecil Hadlow, Works Chemist and Technical Assistant, Gas-Works, Wellington, Salop.

Associates.

*Clark, Herbert Patrick, Gas Examiner for East Ham, Barking, and part of Essex.
Fleminger, Sidney, F.C.S., Official Gas Examiner and Consulting Chemist, London.
Townend, Frank Sutcliffe, B.Sc. (Eng.), Assistant to Dr. E. W. Smith, Technical Director of the Woodall-Duckham Companies, London.

The President: The Institution is progressing as far as numbers are concerned.

More Telegrams.

The President: I have received a telegram this morning from the Italian Association of Gas Engineers, sending salutations and best wishes to their English colleagues. I have also received a message from the Mayor of Derby, regretting that, owing to civic and other duties, he is unable to be with us.

A Member for Derby.

The President: I now have the greatest pleasure in introducing to you Sir Richard Luce, one of the Members of Parliament for Derby; and I take it as a personal compliment that he has come here. When I tell you he was in the House of Commons until 4 o'clock this morning, I think it shows a great example. We are very delighted to have Sir Richard with us, not only because he is an eminent Member of Parliament, but because—and this may appeal more to you—he is a very eminent surgeon. I will ask him to say a few words.

Sir Richard Luce: I take it as a great honour that you should have asked me to come here to-day. May I also say that I consider it a great honour to Derby that you should have elected my fellow townsman, Mr. Ferguson Bell, as the President of your Institution for this year? I am very happy to be associated with you to-day in supporting him on this great occasion, and wish you every success in your meetings.

Wrought-Iron Tubing Committee.

After Mr. W. M. Carr had replied to the discussion on his paper, which had taken place on Tuesday afternoon, the report of the Wrought-Iron Tubing Committee was submitted by Mr. R. H. Ruthven, Hon. Secretary of the Committee. See notice on p. 932.

International Commission on Illumination.

Mr. Robert Watson, of Doncaster (delegate of the Institution), presented the report of the sixth meeting of the International Commission on Illumination. See notice on p. 932.

Joint Refractories Research Committee.

The report of the Joint Refractories Research Committee was next taken. It was presented by Mr. J. P. Leather, the Chairman of the Committee. See p. 932.

Developments in Gas Calorimetry

Prof. C. V. Boys, F.R.S. (one of the Gas Referees), read a paper entitled "Developments in Gas Calorimetry;" and this, together with the discussion, is reproduced on p. 933.

Institution Gas Research Fellowship.

Prof. Cobb introduced the report of the Institution Gas Research Fellowship on "The Influence of the Inorganic Constituents of Coal in Carbonization and Gasification, with Special Reference to Nitrogen and Sulphur," by Mr. C. B. Marson, B.Sc. (Institution Gas Research Fellow), and Prof. J. W. Cobb, C.B.E., B.Sc., F.I.C. (Livesey Professor). See p. 932.

Town Gas for Motive Power.

On the resumption of the proceedings on Thursday morning, Sir Dugald Clerk, K.B.E., F.R.S., read a paper on "Town Gas for Motive Power." This and the discussion are given on p. 939.

The President: I have the pleasant duty of asking Sir Dugald Clerk to give this communication. Sir Dugald Clerk requires no introduction to any Institution in London, much less to the gentlemen whom I see before me, and I am quite sure that you will be delighted that he is able to come here and read a paper.

Economics of Gas Production on the Thermal Basis.

The final paper of the meeting was by Mr. George Evetts, and was entitled "The Economics of Gas Production on the Thermal Basis." This with the discussion will be found on p. 943.

The Balloting List.

The President: I have now to announce the result of the balloting. You will be glad to know that Mr. Botley has been unanimously elected President of our Institution. [Applause.] On your behalf, I offer to Mr. Botley sincere congratulations, and feel sure he will receive the full support, not only of the Council, but of all the members of the Institution. We hope that he will have a very successful and very pleasant year of office. The two Vice-Presidents are my friend Mr. Wilkinson, who resides not far away from Derby; as he comes from the Midlands, we know he is a good man. The other is Mr. Madden, who has been prominently connected with the Institution. He has taken a very active part in the proceedings, and I am sure we are all very pleased to know that he has agreed to become Junior Vice-President. For Auditors, we have our good friend Mr. Shoubridge, and Messrs. Wood, Drew, & Co. The Hon. Secretary, as you will all fully expect, is another old friend, Mr. Price. Mr. Price is invaluable. He tells the President what to do, and the President does it. The ordinary members of Council are Messrs. Armitage, Bennett, Copp, and Langford. We had a very good list of nominations. It took me a long time to decide for whom I should vote. In fact, I should have liked to vote for them all, because they would have made excellent members of Council. However, those who have not been elected I hope will allow their names to go forward on a future occasion, when they will doubtless be elected. I call upon our new President, Mr. Botley.

The New President.

Mr. C. F. Botley (Hastings): Mr. President and gentlemen, it is perhaps difficult in a few words to express one's feelings on an occasion like this; but I would first of all like to express a sense of the honour that I realize has been done me by those who in the first instance thought fit to nominate me, and now by you who have seen your way to support that nomination. Remembering that it has been my great privilege to work with my friend Mr. Bell and other of the Immediate Past-Presidents, I shall have some trepidation in endeavouring to emulate the work they have so splendidly done. But with your support—and without that, of course, it would be quite impossible to be a worthy President of the Institution—and the support of the Council, of which I am assured, I will strive to the utmost of my ability to uphold the high traditions and the great usefulness of the Institution.

List of New Officers.

President.—Mr. Charles F. Botley, of Hastings.
Senior Vice-President.—Mr. John Wilkinson, of Nottingham.
Junior Vice-President.—Mr. Henry D. Madden, of Cardiff.
Auditors.—Mr. Sydney Y. Shoubridge, of Eastbourne, and Messrs. Wood, Drew, & Co., of London.
Hon. Secretary.—Mr. W. E. Price, of West Chobham.
Ordinary Members of Council.—Messrs. Leonard J. Langford, of Tunbridge Wells; Harold E. Copp, of Hull; William H. Bennett, of Redhill; and Mr. Cecil Rhodes Armitage, of London.

Presidential Certificate.

Mr. Botley: I am not President yet; but by virtue of my office as Senior Vice-President, I have—it is the usual procedure—now to perform one of the pleasant duties which fall to the holder of the office. That is to put before the meeting in the best way I can an expression of our thanks to Mr. Bell, our President. [Applause.] Having had the great pleasure of being associated with my old friend Mr. Bell as one of the Vice-Presidents, I have had the opportunity of seeing from behind the scenes what our President has done; and I am sure that I am voicing the views of all of you when I say that he has fulfilled the expectations of those of you who know him. When Mr. Ferguson Bell some years ago stood aside, as was so very gracefully acknowledged by Mr. Henry Woodall at our opening session, in order that we might have the benefit of the services of the late Sir Corbet Woodall, he did so very willingly; and, as he himself has pointed out, the Institution have possibly been the gainers. We have had from him the benefit of extended experience, and he has perhaps been able to do for us what he could not have done years ago. We have had a most successful meeting; and I can assure you that, whatever help he has had—and of course Mr. Price, and the Secretary, and the members of Council have loyally rendered assistance to him—the initiation of practically everything has been due to the President. You know how he has drawn upon his knowledge of facts and people, and has secured at this meeting the attendance of distinguished guests. We have, I believe, derived a very great and lasting benefit from this meeting. But we are indebted to our President not only from the point of view of the gas industry; we must not forget the social side. As one who participated in that most enjoyable function last Tuesday, I must say that we owe Mr. Bell, Mrs. Bell, and their daughters very many thanks; and those of you who are going to Derby have a rich treat in store. Our President has rendered to the town of Derby and to the Company with which he is connected invaluable services; and I was very pleased to find that one, at any rate, of the Members of Parliament for Derby is of the same opinion. Doubtless both of them are; but I only heard one of them actually speaking. We are looking forward to a great day at Derby, and to the opportunity of congratulating our President there upon his actual work in his own town.

Before I sit down, I have another very pleasant duty to fulfil on your behalf. You know that it has within the last year or two been decided that there shall be given to the President a certificate, recording the fact that he has served the Institution in that capacity. No one, I venture to say, occupies the Presidential Chair without having a lasting recollection of the duties and pleasures which appertain to the office. But, Sir, there are those who come after us; and it is probably gratifying to our friends to have something tangible to remind them that we have done certain things. Memory, after all, is very short-lived. We pass away, and what we have done is apt to be very soon forgotten. Therefore it is very proper that there should be something to show that we have at some time or other been deemed worthy to be put at the head of the profession to which we belong. I have the greatest pleasure in asking you, Sir, to accept this certificate, and in addition I tender you our heartiest thanks for the invaluable services you have rendered to the industry and to us during the past year. It is not necessary for that to be seconded. [Applause.]

The President: I do very sincerely thank Mr. Botley for his altogether too flattering remarks with reference to

the services that I have been permitted to perform. My year of office has been an extremely pleasant one, and I have made a host of friends. I am delighted with the certificate, which shall be hung up in my study, to remind me of a very happy year. My wife is extremely pleased to know that our social function was a success, and she is looking forward to seeing at Derby a great number of you, accompanied by your ladies. I have received at the hands of the Council the fullest support, and also extreme kindness from the members of the Institution. This Institution, as is the case with similar bodies, depends very much upon what the members put into it; and the members during the past year have put a good deal of work into the Institution. This accounts, no doubt, for the success of our annual meeting. I can assure Mr. Botley he need have no fears in taking on the Presidency—he will receive the whole-hearted support, not only of the members of the Council, but of the entire Institution. I thank you most cordially for the kind way in which you have treated me during my year of office. If I have fulfilled your expectations, I am amply repaid.

Votes of Thanks.

The President: Before we separate, I should like to propose that the best thanks of the Institution be given to the Institution of Civil Engineers for their kindness in granting us the use of their House and this beautiful hall for our meetings. We are very glad indeed to get such excellent accommodation, which conduces greatly to the success of our meetings; and we thank them very sincerely.

Mr. F. P. Tarratt (Newcastle-on-Tyne): I second with pleasure this vote of thanks to the Institution of Civil Engineers. We much appreciate the kindness that they have extended to us.

Mr. John Wilkinson (Nottingham): I propose that the best thanks of this meeting be accorded to the Chairman and Directors of the Derby Gas Light and Coke Company for their invitation to visit the town, and for the hospitable arrangements that have been made for members and their ladies. We have seen what the President has done to entertain us here in London; and I am quite sure his Chairman and Directors will not be behind him.

Mr. H. D. Madden (Cardiff): It is a great pleasure to second that resolution. I think we are already indebted to the Chairman and Directors of the Derby Gas Company, for I feel sure that Mr. Bell has been backed-up by them handsomely during his year of office—which will certainly do a tremendous lot of good for the gas industry. Excellent propaganda work has been done.

The President: On behalf of the Chairman and Directors of the Derby Gas Company, whom it is my privilege to serve, I thank you very much for this vote, which shall be conveyed to the Board, who have been very kind to me during the past year. They told me when I became President of the Institution I was quite free to attend meetings in London and other places. They have, in fact, taken a lively interest in everything that affects the Institution. I am very glad that you have passed this vote, because at Derby the time will be fully occupied. We thought you would prefer to see the beauties of Derbyshire rather than to go through a toast list at the luncheon.

Mr. W. J. Smith (Bolton): It is my privilege to propose a vote of thanks to the National Physical Laboratory, the Gas Light and Coke Company, and the South Metropolitan Gas Company, for the very excellent arrangements made by them for the entertainment of the members of the Institution this afternoon.

Mr. W. S. Morland (Gloucester): I have pleasure in seconding that.

The President: There is another vote of thanks that I should like to propose. That is to Sir Henry Fowler, who used to be a member of this Institution, and is now Locomotive Superintendent to the L.M. & S. Railway. He was here yesterday, and you will see him again to-morrow at Derby. I know he is looking forward to renewing many old friendships, and he will show you an interesting locomotive works. I would also include the Carriage and Wagon Works of the L.M. & S. Railway, where you will see most ingenious labour-saving devices, and the Royal Crown Porcelain Works, to which the ladies are going.

Mr. Hubert Pooley (Leicester): I will second that, for I am quite certain we are going to have a most interesting day to-morrow.

Mr. C. Diamond (Barrow-in-Furness): As one of the younger members of the Institution, I deem it an honour to propose a vote of thanks to the Council, the Hon. Secretary, the authors of papers, the Research Committees, the Scrutineers, and the Auditors. It needs no words of mine to extol their labours.

Mr. J. H. Canning (Newport): It is a pleasure to me to second that, for I am sure a vote of thanks is due to those gentlemen who have co-operated with our President so excellently in making this meeting an unqualified success.

The President: I feel I must say how much I am indebted to Mr. Price, and to our Secretary, Mr. Dunn. Mr. Dunn has been laid-up for perhaps a fortnight; but he has been incessantly working at home, and the staff have helped me greatly. I have been in constant communication with Mr. Dunn all through the year, and have always found him most zealous and anxious to promote the welfare of the Institution in every possible way. I believe he has been our Secretary for about thirty years; and the arrangements he has made on all occasions have amply proved his capacity.

Mr. Wilkinson: The vote is an omnibus one, and, on behalf of the passengers travelling inside that omnibus, I thank you heartily for your kind expression of appreciation of the efforts that have been made on your behalf.

Mr. Price: I am much obliged to you for again electing me your Hon. Secretary; and while you do that I will do my best to give advice and guidance, if necessary, to the gentleman who happens to be the President for the time being. Your selection of President is, however, so excellent that really I find that the material I have to handle has already been modelled in a most proper manner, and all that I have to do is to see that it does not fall to pieces. [Laughter.]

Mr. Walter Dunn: I feel very much touched by what the President has said. I appreciate it immensely, and I am proud of being Secretary. I hope that I may continue to give the Institution satisfaction in that capacity. In the "Gas Journal," Mr. Bezant (the Editor) has been digging up old history; and I find that I am thirty years older than I was when I became your Secretary. We are, however, all growing older together; so I do not mind. I am a Scout Master, and am proud of it; and I think that helps to keep me young. Those who understand what a pleasure it is to see one's work succeed will understand my feelings when I tell you how proud I am to see our Institution flourish. Everyone connected with the Institution helps me; I could not do it alone. I make suggestions which are sometimes turned down and sometimes turned up, and become trumps. I have a suggestion for the new President, which I hope will mature.

Next Year's Meeting.

Mr. Botley: There is just one other subject I should like to refer to before the meeting disperses. I should not wish to be absolutely committal on the matter to-day; but there is just a possibility that the meeting could be held in Hastings next year. Nothing must, however, be done which would in any way interfere with the convenience of the members or the successful working of the Institution; and I should like, with the President's permission, to get some indication of the feeling of the meeting on the matter. Of course, if the meeting were held in London, there would be a possibility of an excursion to Hastings. Will somebody make a proposition? Well, as there seems to be no decided feeling on the matter one way or the other, you will have to leave it to the Council and myself to decide.

The President: That, gentlemen, concludes our business.

THE PRESIDENTIAL ADDRESS

OF

Mr. J. FERGUSON BELL, M.Inst.C.E., M.I.Mech.E.

General Manager and Engineer of the Derby Gas Light and Coke Company.

This being the first occasion on which it is my privilege to meet you collectively as President, I desire to take the opportunity to express my sincere thanks for the honour you have conferred upon me. The election to this Chair is the highest distinction which the Institution can bestow on those who have endeavoured to serve it faithfully and well. This Institution has attained to such a position that to be its President is to enjoy an honour which it is impossible to regard lightly; and I solicit the continued enthusiastic activity of members to promote the advancement of our industry by applying themselves to the solution of the many problems on which success depends. A year ago the Institution was 1005 strong; to-day we number about 1100. This indicates we are a growing body, representing a rapidly growing industry, with immense potentialities for the benefit of the community.

Honorary Members.

The honorary members number 21, a notable addition during the year being H.R.H. the Prince of Wales, who graciously consented to become an honorary life member. The Institution, as the technical head of the gas industry, is proud of this Royal recognition of service rendered to the community by one of the most important of our public utility services.

In addition, the proposed transfer of Mr. Charles Hunt —now the doyen of the gas industry—to honorary membership will, I feel sure, receive your hearty approval. Mr. Hunt for many years has been a distinguished member, and as an engineer, administrator, and adviser has won a prominent position. This transfer is to mark our recognition of his many valued services.

It was intended to confer a similar honour on one who for half-a-century was an outstanding and striking personality in the profession. I refer to the late Mr. H. E. Jones, who, as Chairman and Director of many gas companies, both at home and abroad, did invaluable service for the industry. The name of H. E. Jones will be long remembered as the donor of the "London" gold medal—shortly before his death he transferred securities to this Institution to provide for a gold medal to be presented annually.

Another name well known and deservedly respected is that of Alderman F. J. West, the present Lord Mayor of Manchester, who has done much to advance the scientific carbonization of coal. For many years the name of West has been a household word in the gas industry; and your Council decided to nominate Alderman F. J. West as an honorary member of the Institution—a course which I know the members will approve.

Institution Activities.

The activities of the Institution are indicated by our annual "Transactions," and by the proceedings of the Council as reported from time to time in the Technical Press They indicate steady progress, as the result of our deliberations and specialized investigations in conjunction with other organizations for co-ordination of scientific and industrial research, also independent investigations of essential problems to bring about a greater interfusion of theoretical scientific information and practical knowledge as to the best and most effective methods to elucidate those problems peculiar to our specialized industry.

Scientific research is the main, if not the only, source of fresh productivity in industry; and it is only by increased productivity that this country will find a way out of its present economic difficulties.

Education.

Our industry is of such a technical character that well-trained skilled technicians are absolutely necessary if we are to continue to carry on successfully the work which, year by year, becomes more important, as the figures I am about to give you conclusively prove.

Your Council for some time have had under consideration an Education Scheme, whereby those engaged in the industry will be afforded increased opportunities to equip themselves more thoroughly for their work. It has been approved by the Board of Education and City and Guilds of London Institute. Also I am happy to state it will generally receive the support of Local Education Authorities.

The Institution Education Syllabus has recently been issued. I commend this step, which may eventually be one of far-reaching importance, and ask your active co-operation towards making it a success. It is probable that membership of this Institution will, in the near future, be by examination. There are already 23 Technical Colleges giving "Course" instructions under the scheme. The number of students applying for examination shows a gratifying increase, being almost double that of the previous year. The Committee are to be congratulated upon the success that has attended their efforts, upon which they have spent much time and thought.

Importance of the Gas Industry.

The magnitude of our industry is indicated by the latest available Board of Trade returns relating to all authorized gas undertakings in Great Britain (for the year 1923) There are 790 company and local authorities' undertakings; the summary relating thereto is as follows:

Total coal, C.W.G., and other gas, millions c.ft.		259,819¾
Coal gas made, millions c.ft.		217,756¾
C.W.G. or blue gas made, millions c.ft.		38,347½
Coke oven and other gas, millions c.ft.		3,745¼
Coal carbonized, tons		16,460,632
Coke used for C.W.G., tons		906,717
Oil used for C.W.G., galls.		42,751,644
Coke and breeze made, tons		11,098,169
Tar made, galls.		181,962,574
Sulphate of ammonia made, tons		117,166
Consumers—Prepayment	4,231,243	
Ordinary	3,579,107	
		7,810,350
Length of gas mains, miles		40,984¼

The total nominal capital invested in the undertakings dealt with in this return is £165,210,254 (including loans raised by local authorities and sums repaid), an increase of £2,281,229 over the previous year. The receipts of the undertakings on revenue account amount to £67,576,358, and the expenditure to £56,593,900, which includes some 2½ million pounds for local rates—leaving a gross profit of £10,982,458—£444,758 less than in 1922, due mainly to the lower prices charged for gas. The recent slump in prices of all residual products will unfortunately mean an increase this year in the price of gas in most places.

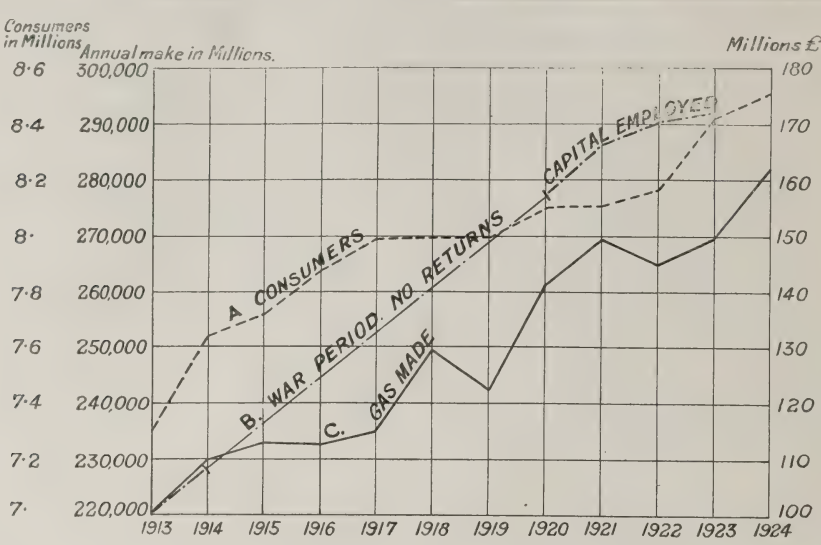
Striking Progress.

The striking progress of the gas industry in the United Kingdom since 1913 is shown by the diagram (Fig. 1) of statutory and non-statutory undertakings, giving the estimated total quantity in millions of cubic feet of gas made, number of consumers in millions, and capital employed in millions of pounds sterling.

It will be seen from the diagram that in the last five years the output has increased from 242 thousand million to 282 thousand million c.ft., an increase of no less than 40 thousand million c.ft., or more than the total gas made by the Gas Light and Coke Company, which is by far the largest gas undertaking in the world. Incidentally, it is interesting to record the fact that the Gas Light and Coke Company alone supplies more heat units than the combined output of all the electricity undertakings in this country.

The number of consumers has increased from about 8 millions to over 8½ millions. This increase alone is equal to the total population of two large cities such as Nottingham and Leicester.

The capital employed in the last three years has increased from £156,869,911 in 1920 to £173,470,766



CURVE **A**. *Number of Consumers in Millions.*

CURVE **B**. *Total Share & Loan Capital employed in Millions of £.*

CURVE **C**. *Annual makes of Gas in Millions of Cubic Feet.*

FIG. 1.—STATUTORY AND NON-STATUTORY UNDERTAKINGS, 1913-24.

in 1923. This is a growth of £16,600,855, or an average increase of just over £5,533,618 per annum.

This remarkable progress conclusively indicates that town gas in Great Britain is being used in an increasing quantity by an increasing number of consumers.

The Position in the United States.

The President of the American Gas Association has been kind enough to send me information as to the position of the gas industry in America. In 1903 the sales of manufactured gas totalled 105½ thousand million c.ft., and 124 thousand million c.ft. of natural gas; and in 1923 a new high record was reached of 370 thousand million c.ft. of manufactured gas and 760 thousand million c.ft. of natural gas. Thus in twenty years the sale of manufactured and natural gas in America reached the huge figure of 1130 thousand millions of c.ft., or about four times the make of the whole of the 790 authorized gas undertakings in Great Britain for the year 1923.

In certain districts in the United States natural gas is giving out; but its use in large quantities has so accustomed consumers to the many advantages and economies attending gaseous fuel that they will not return to solid fuel. There are 9½ million consumers, and new ones are being added in the United States at the rate of more than 400,000 a year. A notable fact is that, of the 964 undertakings, only 51 are operated by municipal authorities. A great expansion in auxiliary house heating by gas is taking place, and companies are putting in house-heating installations at the rate of about 10,000 a year. In some sections of the country they are supplying a large number of gas refrigeration machine installations. Annual sales of gas appliances aggregate 750,000 cooking stoves, 425,000 water heaters and 400,000 gas fires.

One of the principal factors responsible for the greatly increased sale of gas in America is the growing demand for gas in industry, where, according to the American Gas Association, gas is now used in more than 5000 separate and distinct ways. There was an increased consumption during the last decade of more than double, while its use for industrial purposes increased about 1000 p.ct.

In order to keep up with the demands by consumers, the gas companies spent $450,000,000 during 1923 on new works; and reports filed with the American Gas Association by its members show that the industry is enjoying the greatest expansion in its history. The results for 1924 are not yet available, but they are expected to show a large increase over the previous year. This is in a country with an abundance of natural water power, which has been called "white coal," rendering the generation of electricity in large quantities comparatively easy and inexpensive.

Cheap and Ample Supplies of Heat Energy.

Statistics are wearisome. I have quoted sufficient to indicate the importance and magnitude of the gas industry in this country and abroad. Contrary to the opinion of those unacquainted with the facts, its greatest growth has occurred during the past twenty years. Instead of declining in importance, it is now on the eve of its greatest expansion—given the same consideration as its competitors. The benefits that can be derived from one of the most important key industries in the country are being realized—whereby a substantial increase is obtained in the availability of the potential heat units of the coal used, and at the same time recovery of valuable bye-products so necessary to the country in time of peace. Their applicability and vital necessity were demonstrated in a remarkable manner during the war.

The provision of cheap and ample supplies of heat energy in the form of gaseous fuel can be best and most economically provided by the gas industry. In this connection, it is also a remarkable sign of the times that the British Commercial Gas Association have now on record a list of over 4000 trades in which gas is used, with an average of seven processes to each trade. This indicates the immense field there is for future development.

The gas industry has become one of the greatest co-operative efforts in the world. Through the National Gas Council, representing 841 company and municipal undertakings, being 88 p.ct. of the total make of gas in the United Kingdom, the industry has combined its forces for the benefit of consumers, employees, and producers, very ably guided by Mr. Milne Watson, D.L., the Governor of the Gas Light and Coke Company, assisted by an efficient staff.

Coal Conservation.

The importance of a more efficient utilization of our coal supplies, which are the foundation of this country's industrial position, demands that more attention should be given to this subject. Our national fuel resources are by no means inexhaustible. They are diminishing; yet our wealth of coal is being recklessly squandered in many directions.

The burning of raw coal in furnaces and open grates is extremely wasteful, resulting in unnecessary reduction in

our national coal resources, and also additional loss to the country by non-recovery of valuable bye-products, so essential for many industries. The baneful effect of smoke in most industrial centres is evident from the disfiguring effects, resulting in the drab and sordid appearance of many of our towns, and also in a reduction of available sunlight and ultra-violet rays, which not only adversely affects health, but involves an appreciable annual expenditure in making good the damage to buildings, &c.

The combination kitchen range for use simultaneously for heating, cooking, and hot-water supply is excessively extravagant in fuel and inefficient as compared with separate appliances designed for the special purposes. For instance, a coke-fired hot-water boiler uses only one-quarter of the fuel required by a range boiler. The combination of several functions in one range renders each separate function wasteful when used alone; and in ordinary practice they are not simultaneously required. For cooking and heating, gaseous fuel, used in properly designed appliances, effects a big saving in fuel and labour, with convenience and economy. The existing enactments are not sufficiently drastic to ensure even the curtailment of the evils arising from coal smoke and invisible sulphurous acid pollution. The time has arrived when the use of smoky fuel should be prohibited by legislation in the interest of health and to conserve our coal supplies.

The more extended use of gaseous fuel for trade and domestic purposes means a substantial increase in thermal efficiency, abating the smoke nuisance, and promoting better health, comfort, and convenience, less labour, and improved amenities of our towns. It is estimated that the extra cost for fuel and washing materials attributable to the smoky atmosphere in many industrial areas is equal to 7½d. per week per household, which for a town of a quarter-of-a-million inhabitants means a loss of over £100,000 per annum—and this without taking into account the contributory cause of general ill-health and squalid appearance of those smoke-laden districts.

Nowhere is coal treated with the same over-all efficiency as in the principal gas-works of this country; the thermal efficiency being well over 70 p.ct.

The total coal mined in the United Kingdom during 1923 was about 250 million tons. Some 186 million tons, or 75 p.ct., was for home requirements, of which 38 million tons were used for domestic purposes. The bulk of this is burned in open firegrates, giving a useful heat efficiency of only 15 to 25 p.ct., and worse still, serious pollution of the atmosphere by the production of coal smoke and noxious vapours, which are destructive alike to property and health.

For industrial purposes (other than used by railways, gas and electricity works, coke ovens, manufactured fuel, steamships, and exports), 72 million tons were used, making, with the 38 millions for domestic purposes, a total of 110 million tons, or 44 p.ct. of the total production. Of this, by our present lavish methods, it is estimated we waste some 40 million tons a year, which, at (say) 15s. per ton, means a loss of no less than 30 million sterling per annum to the country.

Gas and Electrical Efficiencies.

In view of suggested Government subsidies for the development of electricity, it is perhaps as well that I should inform the public how the matter stands between gas and electrical efficiencies. I do not desire to belittle the importance and progress of electricity, or to depreciate the valuable service performed by the electric supply industry, but rather to congratulate the electrical industry upon its progress. The handsome dividends it is able to pay its shareholders indicate prosperity, and no necessity for State aid.

The efficiencies of gas, coal, and electrical apparatus given below are the results of reliable experimental investigations with the most modern appliances:

Gas Appliances.

Gas Cooking Stoves of the Best Type

Hotplate boiling burner efficiency . . . . . 57 p.ct net calorific value
Oven cooking (gas at 8d. per therm) . . . . six 2-lb. loaves can be baked for less than 1d.

Gas Fires of Latest Type.

Radiant heat . . . . . 50–55 p.ct. net calorific value
Low-temperature convected heat . . . . 15–20 ,, ,, ,,
Flue heat for ventilation. . . . . Balance

Water Heating.

Geyser efficiency . . . . . 85–90 p.ct. gross calorific value
Circulator—boiler efficiency . . . . . 75–80 ,, ,, ,,

Furnace Operations.

Melting of yellow brass—pouring temperature 1000° C. . . . . } 2½ to 3 c.ft. per lb. (according to stand-by losses)
Steel annealing . . . . . 3000 to 4000 c.ft. per ton (according to size of articles)

Coal-Consuming Appliances.

Open Grate Fire.

Radiant efficiency . . . . . 15 to 25 p.ct.

Hot Water Supply from Coal Range Boiler.

Back boiler of range has a general efficiency of . . 11 to 12 p.ct.

Coal Range Oven.

Coal burned in the average commercial range, heat transmitted to oven . . . . . 2½ p.ct.

Total Efficiency.

Considering the coal range as a whole, it is estimated that the average efficiency is only about . . . 7½ p.ct.

Electrical Appliances.

Cookers of Best Type.

Hotplate boiling efficiency . . . . . 30 to 50 p.ct.

(according to whether the kettle is bright or black, and the care taken in switching-off the current before boiling actually occurs, allowing the water to boil as a result of the heat emitted by the elements after the current has been turned off).

Oven.

The best type of electrical oven will be found to use the same number of B.Th.U. as the best type of gas oven.

Water Heating.

Electrical immersion-heaters for boiling water have an efficiency of about . . . . . 90 p.ct.

Electrical Radiators.

If placed in the middle of the room, their heating efficiency is . . . . . 100 p.ct.

No allowance is made, however, for ventilation, which is essential, and with which they should be debited.

With electricity at the low price of 1d. per unit, and gas at 8d. per therm, heating operations, irrespective of the type of apparatus, cost from three to four times as much as corresponding operations performed by the aid of suitable gas appliances.

Carbonizing.

The freedom granted by the Gas Regulation Act, 1920, to introduce a method of charge based on potential heat energy supplied, in place of the volume basis, with reasonable liberty to enable gas undertakings to select those coals from the nearest mining centres, has resulted in renewed interest in the carbonization or distillation of coal for gaseous, solid, and liquid products. It is not my intention to differentiate between the various systems of carbonization or auxiliary processes; but I am of opinion that gas-works—more especially the larger ones—should, as far as possible, instal plant that will enable the undertaking to take full advantage of the prevailing economic market conditions, and so reduce the cost of their chief product. My experience during the war, and later with a three months' stoppage of coal supplies, was that ample plant which will produce either blue water gas or any quality of C.W.G., as auxiliary to the coal-gas plant and for emergency purposes, is invaluable.

I find from trustworthy data the thermal efficiencies obtainable per ton of coal or coke used in good ordinary practice with modern plant (not the results of special tests) by the various systems of carbonizing for the production of straight or mixed coal gas, and for C.W.G. or blue water gas per ton of good dry coke gasified, are as follows:

—	Quality of Gas. B.Th.U. per C.Ft.	Gas. P.Ct.	Coke. P.Ct.	Tar. P.Ct.	Heat Used and Lost in Manufacture. P.Ct.	Thermal Efficiency of Process. P.Ct.	Efficiency of Gas Production. P.Ct.
1. Horizontals. .	550	24·97	48·12	5·61	21·30	78 70	54·0
2. Do., with W.G. added . . .	500	28·17	42·12	4·89	24·82	75·18	53·2
3. Verticals with steaming, with W.H. boiler .	450	29·19	40·60	7·68	22·53	77·47	56·4
4. Blue water gas with W. H. boiler . . .	300	62·50	..	..	37·50	62 50	62 5
5. Carburetted W. G. with W.H. boiler .	500	68·00	..	1·75	30 25	69·75	69·2
6. Low-temperature carbonization.	700	13·61	55·33	10·87	20·19	79·81	40·3
7. Complete gasification . .	340	64 26	..	1 00	34 74	65·26	64 9

From these figures, it will be seen there is not much to choose, in regard to thermal efficiency, between the best horizontal and vertical carbonizing plants; but it is

necessary to bear in mind that a high number of therms per ton of coal used may be uneconomic as compared with a lower production by using cheaper grades of coal and smalls—especially is this the case with those undertakings near the collieries. This, however, must not be confused with thermal efficiency, which it should be the effort of all to increase, whatever the grade of fuel used.

For instance, at the Litchurch Works of the Derby Gas Light and Coke Company, by carbonization of cheaper coals and smalls, the over-all thermal efficiency last year was for a mixed gas 70·86 p.ct., and the average cost for coal, coke, and oil 4·48d., *less* residuals 3·34d., or 1·14d. net per therm, for gas of 503·8 B.Th.U. quality. The oil used was only 0·0423 of a gallon per 1000 c.ft., to enable a larger percentage of C.W.G. to meet sudden increases in the demand. The total gas made was 1362½ million c.ft., of which 20·93 p.ct. was blue or slightly carburetted water gas. Thermal efficiency *per se* is not always a reliable guide. The commercial values of ancillary products and their reflex action require to be taken into account in determining the cost of gas into holders. The collateral advantages of blue or lightly carburetted water gas—such as better control of the coke market, saving in capital charges on plant, lower costs for manufacture in repairs and maintenance, and emergency value, which depends to some extent upon local conditions—all require to be taken into account. The manufactured "mixed" gas often has advantages over the single product; and it is for each to study the controlling circumstances.

Complete gasification has not, so far, fulfilled expectations. The low calorific value of the gas produced renders it unsuitable for general distribution over large areas; and also the financial results compare unfavourably with other methods of carbonizing where bye-products return anything from 50 to 80 p.ct. of the cost of coal used. It is suitable as an auxiliary to the coal-gas plant. My experience indicates that it does not possess the same flexibility as blue or carburetted water gas.

It is impossible to exaggerate the importance of doing everything that is possible towards a better utilization of our coal supplies. Hence low-temperature carbonization is attractive, since it produces both gaseous and smokeless solid fuel useful for domestic and trade purposes, and also oil fuel, for which we are now dependent on imported supplies. It has not, however, so far been established by independent data that low-temperature carbonization has yet been placed upon a stable financial basis; and, as compared with high-temperature carbonizing, the efficiency as a gas-making process is low. Also all low-temperature processes depend mainly upon the commercial value of the solid and liquid products.

The admirable reports by the Fuel Research Board, giving the results of experimental investigations on high and low temperature carbonization under skilled scientific supervision, are of the greatest advantage; and I hope this valuable experimental work will be continued. It needs no words of mine to commend research by technical experts to ascertain the properties and suitability, and, by special treatment, to increase the availability of the potential thermal value of, our coal supplies, and so add to the nation's wealth.*

While on this subject, I desire to record great regret at the loss sustained by the death of Sir George Beilby, who was the greatest authority on the problems of fuel research. We owe much to him for active and valuable work extended over many years.

The reports of the investigations by the Research Sub-Committee of this Institution, in conjunction with the Leeds University, into the thermal and chemical efficiencies of manufacture of different grades of gas by various processes, deserve special praise; and the same applies to the investigations by the Refractory Materials Research Committee towards an improvement in the technique of refractories—placing at the disposal of all interested reliable data as regards thermal conductivity, fusion, expansion, contraction, and superimposed weight tests, all of which are so closely allied to successful carbonization.

* By the kindness of Dr. C. H. Lander, Director of Fuel Research, I am able to give as an appendix the experimental results obtained at the Fuel Research Station setting forth the thermal efficiencies for horizontal and vertical retorts, blue and carburetted water gas plants, and low-temperature carbonization. The difference between the thermal efficiency figures of gas production given by the Fuel Research Board and those given by me is mainly due to one set being the result of tests, and the other for actual working results.

Relation Between the Heating Value of Gas and Its Usefulness to the Consumer.

Closely connected with carbonization is the question of the relative usefulness of gases of different heating value and composition, which is not only important to the gas industry, but is one of more or less active controversy.

The investigations by the United States Bureau of Standards into the relative efficiencies of gases differing as widely as natural gas of 1100 B.Th.U. per c.ft. and various grades of manufactured gas from 725 to 500 B.Th.U., and also the reports by our Institution Gas Research Committee on gases from 500 to 240 B.Th.U., indicate that the relative usefulness of various gases for ordinary purposes is directly proportional to their heating value, and that there is no advantage in thermal efficiency for gas of lower heating value, but rather the reverse for gases of low calorific value with high inert content. Hence, within limits, with equal uniformity of quality and pressure, the volume of gas used will vary in inverse proportion to its potential thermal value.

The available heat units supplied in the form of gas are essentially the useful commodity for which the consumer pays, and a measure of the value received. This being so, it is essential that the method of manufacture shall be such as is calculated to deliver to the user the maximum number of heat units at the lowest possible cost, bearing in mind that the gas supplied is suited to the wants and requirements of the district, and the service given is such as will satisfy various users.

My experience indicates that gas of 500 B.Th.U. per c.ft. possesses advantages over that of a lower quality. The efficiency of utilization is somewhat higher, especially if the time required to perform a given operation is taken into account. There is the simplification of accounts and reduction of clerical work, by doing away with the second place of decimals; and, what is perhaps more important, it enables consumers readily to convert volume into therms. The conversion from thousands of cubic feet to therms (100,000 B.Th.U.), and *vice versa*, is simplified, as the thermal equivalent is 5; thus $\frac{1000}{5} = 200$, which is the number of cubic feet to a therm. For variation in price and calculation of dividends under the sliding-scale, a declared value of 500 B.Th.U. is obviously more convenient, as a penny per 1000 c.ft. is equivalent to 1-5th of a penny per therm, and cubic feet in cents as registered by consumers' meters divided by 2 equals therms.

From the National Gas Council return of Orders granted under section 1 of the Gas Regulation Act, 1920, up to Dec. 31, 1924, I observe the declared calorific standards are as follows:

Number of Gas Undertakings.		Calorific Value. B Th.U. per C.Ft.
4	..	270 to 375
66	..	400 to 440
135	..	450
55	..	460 to 470
60	..	475
45 (277)	..	480 to 490
172	..	500
28	..	510 to 600
Total . . 565	Average . .	472

Of the above, 76 have increased their declared value and 8 decreased it; and it will be seen that 277, or almost one-half of the total of 565, supply gas of from 474 to 500 B.Th.U. The tendency is upwards towards the 500 B.Th.U. standard, which seems to me to be in the right direction. It is of interest that the average declared value of the whole 565 undertakings is 472 B.Th.U.

I think there is much to be said for a uniform calorific standard of (say) 500 B.Th.U. for the whole country. This would simplify the adjustment of gas apparatus, and tend to reduce manufacturers' costs. Those who advocate supplying gas of low calorific value appear to ignore distribution costs, which are far from being a negligible item.

Power for Industrial and Other Purposes.

It is generally acknowledged that a modern gas engine is one of the most efficient prime movers available to-day; yet there has been a falling-off in their use of recent years, as a result of keen competition by electric motors—cur-

rent being sold at extremely low rates for power purposes. A formidable competitor is also the crude oil engine. There has been a marked decrease in the use of isolated steam power, except for large users or in special cases where steam is required for other purposes. The smaller steam engine, as regards convenience, availability, and costs, compares very unfavourably with gas, oil, or electricity.

Electricity is an efficient and convenient means of transmitting power. In some instances electric motors are no doubt more convenient and economical than any prime mover; but where the load is reasonably continuous, a gas or oil engine may effect a substantial reduction in running costs.

For crude oil engines, with a low price of £6 per ton for crude oil delivered by road tank-cars, the fuel cost alone is less than for town gas, unless supplied at a specially low rate; but this is only one item. The initial cost of an oil engine is greater than for a gas engine. There is the storage of oil and uncertainty as to its price, increased wear and tear, also higher costs for maintenance and attendance, all of which require to be taken into account when estimating over-all running costs.

Town gas possesses several advantages over producer gas or oil for power purposes. It is always available, there is no cost of storage or getting-in supplies, it is more reliable, needs less attention, and smaller initial outlay is required.

For power purposes it constitutes a desirable proposition, both for suppliers and users. The load factor is a

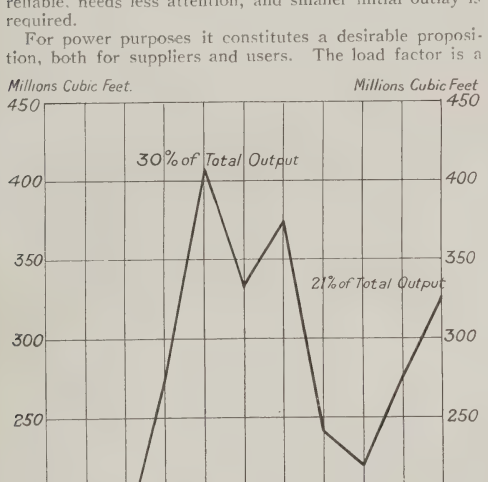


Fig. 2.—Derby Gas Light and Coke Company.

Chart showing gas used for Motor Power and Industrial Purposes, 1914-24.

good one; and it will pay gas undertakings to charge lower prices to encourage its extended use for power, to compete with oil and electricity. Severe competition will compel manufacturers to look more closely into production costs; and there are many industries where a modern type of gas engine will effect an appreciable saving over electric motors.

It is now over twenty years since the Derby Gas Company supplied and fixed gas engines on advantageous hire-purchase terms or sale outright; and the Board recently decided to let gas engines out on simple hire. The reduction in price charged for gas used in Derby for motive power and industrial purposes varies from 15 to 21 p.ct. (according to quantities used) below the initial price of gas. Fig. 2 indicates the large increase in the sale of gas for power and industrial purposes during the last ten years.

The decrease from the maximum of 407 million c.ft. in 1918 to 220 million c.ft. in 1922 was due to post-war effects. Output is now on the increase. Last year (1924) the quantity reached 326 million c.ft., so, notwithstanding continued trade depression, the increase during the last decade is 183 million c.ft. per annum, or 128 p.ct. In 1918 it was 30 p.ct., and last year 21 p.ct., of the total output. This indicates the importance of catering for power and industrial users. Both mean a regular demand all the year round.

In our case, the cost of gas for an engine of (say) 50 H.P. full load is only about one halfpenny per B.H.P. hour. I think you will agree this is cheap power, and that there is no necessity for the Government to subsidize power or other companies to enable manufacturers to obtain cheap energy, as the gas industry is supplying gas at prices which enable manufacturers to obtain power cheaply.

The reliability of modern gas engines, as compared with steam or electric, is at least equal, if not superior to, that of either.

The larger gas undertakings will be well advised to establish a power department under the charge of a skilled mechanic, competent to advise manufacturers, test, and carry out repairs and adjustments to gas engines. It cannot be expected that small gas undertakings can afford the expense of running a separate well-organized power department. I suggest that the larger works should co-operate with the smaller ones, so that the benefit and economy of using modern gas engines running on town gas may be extended over the country to the mutual advantage of producers and users.

I think it only fair to acknowledge that the great increase in the use of gas for numerous industrial purposes is due largely to the skill and enterprise of those who design and make gas apparatus, and to the praiseworthy propaganda work of the British Commercial Gas Association in making known the economy and advantages attending the use of gaseous fuel—work which is actively supported by gas undertakings. I am mindful of the excellent work done by the Society of British Gas Industries, and think this Institution and that Society might become more closely associated with advantage; an interchange of views must always be beneficial to both sides.

Smokeless Gas Coke.

The mild winter in Northern Europe and consequent diminution in demand for coke have led to accumulation of stocks throughout the country. Undertakings which in normal circumstances rely to a large extent on the export market for coke are naturally the hardest hit; but the seriousness of the coke position throughout the industry calls for united action with a view to promoting an increase in its use for industrial, as well as for domestic, purposes.

It is not sufficiently appreciated by industrialists, and especially by those who are genuinely concerned and anxious to mitigate the smoke nuisance, that, in addition to its valuable smokeless characteristic, gas coke, either by itself or in admixture with small coal or slack, can and does effect economy in steam raising. Whereas coal slack in normal every-day boiler practice will evaporate on the average about 6 to 7 lbs. of water per pound of slack, coke of good average quality will evaporate upwards of 9 lbs., and will in addition afford complete relief from the consequences of smoke emission.

Proof of the growing appreciation of the inherent advantages of gas coke as a fuel is evidenced by its extended use on the "Sandwich" system at electricity supply and tramway power stations. A contract recently concluded between the London County Council and the South Metropolitan Gas Company (who invariably lead the way) provides for supplies of coke to the Greenwich power station at a rate approximating 50 p.ct. of the total weekly fuel consumption of the station—viz., 3000 tons per week.

The practical consummation of the ideal of closer co-operation, in the national interests, with our electrical friends, is here clearly indicated; and a wider adoption of the "Sandwich" system, which has rendered the use of coke at power stations not only practicable but economical, as compared with coal alone, would tend not only to foster such co-operation in the interest of all concerned, but to remove, at least to some degree, the stigma that unavoidably attaches to the complete destruction of coal when used as fuel in its raw state for the generation of electrical power.

While the use of pulverized coal as fuel at power stations tends towards improved efficiency of combustion, it does not justify in the least the use of raw coal; and while the pulverized coal system may be regarded as an important development in power station equipment, the recent adop-

tion of the "Sandwich" system of coke firing at an important new power station (Barton) brings the latter system right abreast of modern boiler-house practice.

The promotion of domestic uses for coke will, however, appeal to most gas undertakings; and if constant and abundant hot water is admitted to be indispensable in modern domestic and personal hygiene, then a coke-fired boiler must be regarded as a necessary adjunct to the modern household. Herein lies an immense field for expansion.

I should like to commend the propaganda work of the London Coke Committee and their very able fuel expert, Mr. E. W. L. Nicol, Assoc.Inst.C.E., M.I.Mar.E. I think that provincial gas undertakings might with advantage combine to do something in the same direction. All gas undertakings should, by advertising in the local Press, and by circulars, draw attention to the merits of this solid smokeless fuel, and see that facilities are afforded for delivery in small quantities, by means of bags, &c. I observe from "Field's Analysis" for 1923 that the income from coke and breeze of the three Metropolitan Gas Companies was £2,738,108—equal to 2·445d. per therm, or 12·61d. per 1000 c.ft. on gas sold, which indicates the importance of this source of revenue, and the necessity for doing everything possible to promote and popularize the use of coke.

Proposed Government Assistance to the Electric Supply Industry.

I do not, as a rule, refer to a competitive industry; but the proposals put forward that Government assistance should be given to bring about the reorganization and expansion of the electricity supply industry by an issue of Electricity Bonds to an ultimate total value of £50,000,000, guaranteed by the Government, is so manifestly unfair, not only to the gas industry, but to many other industries, that I desire to enter an emphatic protest against any such one-sided scheme to which there are many objections, both on principle and as regards its application.

There is ample room for both gas and electricity in their own spheres; and before any legislation is introduced, the country ought to be made aware of the whole facts, and an answer given to the very important question: To what extent can power and heat and light be cheapened by the conversion as now practised of the potential energy of coal into electric current, or by the more logical way of distillation for separation into gaseous, solid, and liquid products?

It is an admitted fact that the highest thermal efficiency in the utilization of coal is achieved by the gas industry. The efficiencies of gas and electricity in production, distribution, and utilization are as follows:

—	Number of Heat Units Delivered to Consumer per 100 Heat Units in Coal Used — Thermal Efficiency of Manufacture and Distribution.	Number of Heat Units Converted into Useful Work by Consumer per 100 Heat Units in Coal Used.			
		For Heating Rooms.	For Heating and Boiling Water.	For Cooking by Oven.	For Power.
Gas: Average present practice	47·5	29	35	6·2	11·2
Electricity: Average present practice	9·5	9·5	4·8	2·1	8·65

From these figures, it is evident that the maintenance and development of the gas industry are essential in the interest of fuel conservation, apart from other questions.

The proposal for giving an artificial stimulus to the electricity supply industry by means of Government financial assistance should, I think, be considered as to the probable effect of this unprecedented departure:

(1) On national grounds.
(2) From the point of view of:
  (*a*) The electricity supply industry.
  (*b*) Municipal enterprise.
  (*c*) The gas industry.

(1).—National Grounds.

Artificial stimulus to any industry by means of State aid is without precedent, and is essentially contrary to the financial or fiscal policy of this country. State aid to any particular industry constitutes a form of domestic internal protection at the expense of other industries. Coal is our great national asset; and I have already shown that the highest thermal efficiency in the utilization of coal is obtained by high-temperature carbonization.

Cheap electricity is not a panacea for all industrial ills. I find that in most industries the percentage for power costs, as compared with total production costs for materials, labour, rates, and overhead charges, varies from 1 to under 5 p.ct. only—*e.g.*, engineering 2·95, motor cars 2·40, printing 1·90, and paint 1·95 p.ct. For malleable iron castings it is 3 p.ct. only of the total cost per ton. Hence, it will be seen that the plausible cry that industry will revive if only manufacturers can obtain motive power at abnormally low rates is misleading, and will only delude those who put their trust in doctrinaire promises.

It should not be overlooked that the gas industry itself employs five men for every one engaged in the electricity supply industry on the same amount of work done.

Government money spent on the development of electricity may be wasted on uneconomic and unremunerative schemes. The electrical industry itself is sufficiently prosperous to pay for any schemes which would result in a fair remuneration on the capital expended. The pre-war and post-war dividends paid by the Metropolitan and Provincial electric supply companies amply prove this.

Further, it is quite probable that within the next few years a gas turbine will be perfected which may render obsolete the most efficient methods for the generation of electricity in use to-day, and may well make long-distance distribution of electrical current an unnecessary and wasteful practice.

(2).—From the Point of View of the Electricity Supply Industry.

Great doubt is felt by a large body of electricians themselves as to whether any scheme of Government financial assistance can be to the ultimate benefit of the electricity supply industry. The inevitable result of any State-aided uniform scheme for the supply of electricity would be to stereotype and crystallize electrical practice. Future progress would be impeded, cheapness would be retarded, and the industry and the nation would alike suffer.

(3).—From the Point of View of Municipal Enterprise.

The setting-up of super-power stations by means of Government financial assistance must entail the closing-down of a large number of municipal generating stations, thereby depriving the municipality of the control of its own works. Financial assistance granted by the Government to the electricity supply industry must tend to jeopardize municipal enterprise in probably its most successful department—namely, that of gas supply. In this respect, it is noteworthy that about 40 p.ct. of the gas supplied in Great Britain is provided by municipal undertakings, which are justified in expecting that Parliament, which created them, will take no steps to hamper or harass their activities in the future.

(4).—From the Point of View of the Gas Industry.

On these grounds I submit:

(1) That no case has been made out for any subsidy being granted to the electricity supply industry.
(2) That if the Government is determined to adopt a policy of national subsidies, then all rival and competitive trades and industries should receive like subsidies on the same terms and conditions.
(3) That such subsidies should take the form of loans repayable with interest over a period of years by the industry or undertaking assisted, in a similar manner to loans (sanctioned by the Government) to municipal trading departments.

Conclusions.

In the foregoing remarks I have very imperfectly endeavoured to draw attention to some of the more salient matters, confining myself chiefly to those which seem to me to have the most bearing upon the future of our industry.

Labour-aiding appliances do not, as fallible prophets visualized years ago, result in reduction of employment, but in increased output. The descendants of these same prophets think they hear, in the hum of the big electro-turbo generators, the knell of our industry. They are mistaken. Like many other businesses, the gas industry really began to expand when it had to hustle for business. The possibilities in the use of gas are greater than ever; and

I look with confidence to a large extension in its applications both for industrial and domestic purposes.

Before I conclude, I desire to thank those who responded to my recent appeal for increased support to our Benevolent Fund, which really merits more support than it receives, and should rest on a wider basis of annual subscribers. There is a well-known saying, "Charity begins at home." It cannot better begin than in assisting to help those of our calling and their dependants who, through circumstances beyond their control, are no longer able to provide for themselves. I venture to put this before you, not as a duty but a privilege of those who possess the means to help those less fortunate.

APPENDIX.

Thermal Values of Gas Coals and Coke, and Thermal Efficiencies of Horizontal and Vertical Retorts, Blue Water Gas, Carburetted Water Gas, and Low-Temperature Carbonization, compiled by the Staff of the Fuel Research Station, by permission of the Director of Fuel Research.

Thermal Value of Gas Coals and Cokes.

The thermal value of coals varies with the nature of the coal. In gas coals from the same district the variation is normally small when reckoned on a dry ash-free basis.

—	Moisture.	Ash.	Gross Calorific Value.	
			B.Th.U. per Lb.	Dry Ash-Free Coal or Coke.
Coal—				
Durham	1·5	7·0	14,040	15,340
Yorkshire	1·5	7·0	14,030	15,330
Nottinghamshire, Derbyshire	Survey of this coalfield has not yet commenced, and figures are not available.			
Coke—				
Horizontal (1)	1·5	10·2	12,570	14,230
Vertical (2)	0·6	10·7	12,500	14,100
Low temperature (3) (Volatiles 8 p.ct.)	2·5	8·0	13,200	14,750

(1) Durham coal.
(2) Yorkshire coal.
(3) Since the ash in low-temperature coke becomes very apparent on combustion, this commodity is not likely to appeal to the average consumer unless care is taken to reduce the ash content of the raw material by washing, if necessary. The figure given is based on an ash content in the coal of 6 p.ct.

Horizontal Retort Practice.

DURHAM COAL.

	Therms.
Gas	71·8
Coke (total)	207·5
Tar	18·3
	297·6

Taking coal as 14,040 B.Th.U. per lb., or 314·5 therms per ton, the thermal efficiency is 94·5 p.ct.

The carbonizing efficiency, taking 32·0 therms of coke consumed on the retorts, is 84·4 p.ct.

Vertical Retort Practice.

In order to obtain the necessary 500 B.Th.U. standard specified, steaming to the extent of about 8 p.ct. only would be possible with (say) Yorkshire coal:

	Therms.
Coal	314·3 (ash 7·0 p.ct., moisture 1·5 p.ct.)
Coke (total)	186·5
Gas	90·0 (500 B.Th.U. per c.ft.)
Tar	20·0
	296·5, or 94·3 p.ct.

These are Fuel Research Station results; and it is not possible to allocate directly the amount of heat required for auxiliary operations. These can, however, be deduced from the Gas Institution results obtained at Uddingston:

Fuel to setting . . . . . 30·2 therms per ton of coal
Fuel to raise 8 p.ct. of steam . 2·9 ,, ,, ,,

In a modern plant equipped with a waste-heat boiler, sufficient steam could be raised to supply the retorts, the tar, &c., pumps, and probably the gas exhausters.

The net efficiency of the system would therefore be 84·7 p.ct.

Without a waste-heat boiler this figure would be reduced to about 81·5 p.ct.

Blue Water Gas.

The following figures are taken from Fuel Research Station experiments, with calculated allowances for fuel consumed in the process. Figures taken from the Gas Institution work are also shown for comparison, since these were obtained during the actual commercial operation of a plant.

—	Fuel Research Station.	Gas Institution.
	P.Ct.	P.Ct.
(1)—Efficiency of generator	57·81	50·2
Lost in steam raising	3·15	..
Power to blower—		
(1) Electric fan, 14 p.ct. efficiency	2·15	..
(2) Steam turbo blower	6 25	..
Net efficiency of plant—		
(1)	54·9*	
(2)	52 8*	46·3
(2)—If the plant be equipped with a waste-heat boiler, the following efficiencies arise—		
Efficiency of generator	62 4	53·7

* This net efficiency does not make allowance for extra services such as transport of coke, &c.

Carburetted Water Gas.

The following figures are taken from the report by the Gas Investigation Committee. The Fuel Research Station have no data on this process.

Efficiency of water gas generator (excluding steam). . 53·7 p.ct.
Efficiency of carburetted water gas production . . . 68·0 ,,

The efficiency of the "cracking" process was, in these experiments, about 76 p.ct. This agrees with figures supplied to us from time to time by other investigators.

The steam generated in the waste-heat boilers is sufficient to supply all requirements.

Low-Temperature Carbonization.

FUEL RESEARCH STATION.

Vertical Cast-Iron Retorts (630° C.).

	Therms.
Coal, 1 ton	280·0 (moisture 6·6 p.ct., ash 8·9 p.ct.)
Coke, 13·7 cwt.	192·2 (ash 11·0 p.ct.)
Gas, 6970 c.ft.	45·2 (648 B.Th.U.)
Tar, 14·6 gallons	24·9 (sp. gr. 1·07)
	262·3, or 93·7 p.ct.

(1) Fuel gas to setting, 29·2 therms (2500 c.ft. of water gas per hour, 0·25 tons per 4 retorts per hour).
(2) Steam to retorts (up to 10 p.ct.) from waste heat.
(3) Crushing of coal, 1·0 therms.

Net efficiency, allowing for (1) only . . . = 83·2 p.ct.
for (1) and (3) . . = 82·9 ,,

BARNSLEY.

	Therms.
Coal, 20 cwt.	305·5 (moisture 5·2 p.ct., ash 4·5 p.ct.)
Coke, 13·92 cwt.	214·0
Gas, 5620 c.ft.	39·6 (scrubbed)
Tar, 18·62 gallons.	32 7
Spirit, 1·78 ,,	3·1
	289·4, or 94·8 p.ct.

Fuel to settings was excessive during the Fuel Research Station test, and should be reducible from 41·8 to about 35 therms per ton. All steam necessary could be supplied from waste heat.

Net efficiency, 83·3 p.ct.

SOCIAL EVENTS.

THE PRESIDENT'S RECEPTION.

To the President and Mrs. Ferguson Bell some 600 guests are indebted for open-handed hospitality and entertainment at the reception and dance they offered at the Connaught Rooms, Great Queen Street, on the Tuesday evening. Mr. and Mrs. Ferguson Bell, with their daughters, stood for an hour receiving their many guests; and they had a smile and a word of welcome for all. Mrs. Bell carried a beautiful bouquet of yellow roses, presented to her by the Midland Association of Gas Engineers and Managers, and the Misses Bell had been the recipients of sheaves of carnations from Sir Arthur Duckham.

To mention the names of the many distinguished guests would overtax the space allowed in a technical journal for the recording of a social event; but it is our custom to select those who were present as representing the industry's organizations. They were: Of the Institution of Gas Engineers: Mr. C. F. Botley (then Senior Vice-President); Mr. John Wilkinson, O.B.E. (Junior Vice-President); Mr. W. E. Price (Hon. Secretary); and Mr. Walter T. Dunn (Secretary). Of the National Gas Council: Mr. Ernest J. Fottrell (Joint Manager). Of the British Commercial Gas Association: Mr. F. W. Goodenough (Executive Chairman) and Mr. W. M. Mason (Manager). Of the Society of British Gas Industries: Mr. B. B. Waller (Chairman of Council); Sir Alfred Mond, the President, was unavoidably absent, but communicated his deep regrets and good wishes to Mr. Bell. Mr. W. J. A. Butterfield represented the Gas Referees, and Prof. John W. Cobb, C.B.E., the University of Leeds. Mr. Hermann L. Shepherd, Lt.-Col. W. R. Glover, C.M.G., D.S.O., and Mr. James Bridge represented, as their W.M.'s, the Evening Star, the Murdoch, and the Northern Star Lodges respectively. There were present many Past-Presidents of the Institution, including Mr. Samuel Tagg, J.P., Mr. Bell's immediate predecessor; and the District Associations were strongly represented by their officers. "H. E. J." was sadly missed, but all found pleasure in greeting his son, Mr. Frank H. Jones, Vice-President of the South Metropolitan Gas Company. Mr. Reginald Clarry, M.P., was there; but the President of the Institution of Electrical Engineers was detained by the annual meeting of that body in the Midlands, and wrote expressing regret and the greetings of the sister Institution.

Mr. Ronald Glover, M.C., was assiduous in his duties as Master of Ceremonies, and the thanks of all are due to him, as to the following gentlemen who acted as Stewards: Messrs. E. J. Fottrell, H. H. Gracie (Edinburgh), H. D. Madden (Cardiff), W. E. Caton (Oxford), F. H. Robinson (Harrogate), P. G. G. Moon (Bournemouth), F. A. West (Newark), and J. D. Smith, J.P. (as the representative of Ireland).

In spite of the following of last year's excellent precedent of holding the reception at the Connaught Rooms instead of Prince's, the large company overflowed the great banqueting hall, and Mr. Ferguson Bell thoughtfully arranged to have the smaller reception room thrown open as a buffet and sitting-out room. Dancing began at 9 o'clock, and continued, with a short interval, till midnight; the band acquitting themselves nobly in rendering popular dance music with vigour unabating in spite of the warmth of the evening. Nearly everybody danced, and the whole proceedings went with a swing which culminated in an eightsome reel rendered by three sets with characteristic energy, and which reminded many of us Sassenachs that dancing in its truest sense is an art not totally obliterated.

Congratulations to Mr. and Mrs. Ferguson Bell upon the excellence of their generosity and arrangements!

THE LUNCHEON.

The President of the Board of Trade as Chief Guest.

At the close of Wednesday morning's session, a large party repaired to the magnificent premises in Pall Mall of the Royal Automobile Club, in response to an invitation by the President, Vice-Presidents, and Council of the Institution, to meet at luncheon the Right Hon. Sir Philip Cunliffe-Lister, K.B.E., M.C., M.P., the President of the Board of Trade. Many who are well known to all in the industry, and beyond it, were there; but of them it is possible here to mention only a few. The President (Mr. J. Ferguson Bell) occupied the chair; and on his right were Sir P. Cunliffe-Lister, Dr. Charles Carpenter, C.B.E., Mr. R. G. Clarry, M.P., Sir Dugald Clerk, K.B.E., D.Sc., F.R.S., Mr. Henry Woodall, Mr. Thomas Goulden, Mr. Thomas Hardie, and Mr. H. C. Honey. To the President's left sat the Right Hon. J. H. Thomas, P.C., M.P., Mr. W. Woolley, Mr. D. Milne Watson, and Major-General Sir R. Luce, M.P. The vice-chairs were occupied by the Vice-Presidents of the Institution (Mr. C. F. Botley and Mr. J. Wilkinson). Among the visitors, also, were Presidents, &c., of kindred associations. After the Loyal Toasts had been honoured at the call of the Chair,

Four Square in Defence of the Empire.

The Right Hon. J. H. Thomas, who had to leave early to fulfil another engagement, said their Chairman and the President of the Board of Trade had consented to his toast taking precedence. As a matter of fact, it really ought to take precedence, because it was the toast of "Success, Prosperity, and Long Life to the Institution of Gas Engineers." Although "long life" was not included in the toast as printed, he had deliberately added it, as a sentiment to which they would drink with enthusiasm. He was really in some difficulty to know quite the reason that would warrant them in accepting him as a fitting person to propose the toast; but after all, it might not be hard to justify it. They were gas producers; while the politicians were gas distributors. [Laughter.] He was also one of the Members of Parliament for Derby; and whatever might be said about the gas undertakings in other parts of the country, they must believe him when he told them that Derby of necessity stood supreme. This was evidence of their wisdom in appointing as their President a Derby man. Now, he had been asked to propose "Prosperity to the Institution"—an Institution that was not only represented there by distinguished men in the profession, but that included in its membership people from overseas—in fact, from all parts of the world. He would say to the Overseas Dominions: "We welcome you among us as grown-up sons and brothers." Then he would say to their foreign colleagues who were represented: "We welcome you for what you can contribute to the world in science and knowledge." Because, after all, the real object of that Institution—the one thing above all others that justified its claim to support—was to encourage the acquisition by young men of fresh knowledge. This was why he thought it was the duty of all to give their blessings to the Institution. Referring to politics in this country, he would just like to say one thing to their Colonial and foreign guests—the failure to keep in mind which sometimes led to confusion of thought and difficulties that would be avoided if it were remembered. It was this: "Whatever may be the political differences—and they are many—whatever may be the political fortunes of parties, whatever may be the interests of class or creed, in this country, the past history of our country proves, and everything that we see to-day demonstrates, that there is no varying of the policy that, however much we may quarrel among ourselves, when the real fundamental issue of the Empire and its welfare is involved, they will always find us standing four square in defence of that Empire." ["Hear, hear."] Because the members of the Institution had an opportunity of meeting together, of exchanging views, of understanding one another better, and of pooling their knowledge (which was not knowledge of benefit to them alone, but must always be of benefit to the community), he was delighted to be present among them and propose the toast of "Success, Prosperity, and Long Life to the Institution"—with special emphasis on the words "long life."

Out for Efficiency.

The Chairman, responding, expressed high appreciation of all the kind things that had been said about the Institution and the gas industry by Mr. Thomas. Public utility services were not always appreciated as they deserved to be. The efficiency of their industry was what they were out for. They were out to serve the public by giving them an ample supply of gaseous energy at the lowest possible price. He ventured to think such social functions as the one they were then enjoying were helpful to all parties, because misunderstandings often arose through misapprehension of facts; and it was well that people should realize there were two sides to most questions. They were glad to welcome Sir Cunliffe-Lister, not only as President of the Board of Trade, but for his own personal sake. They were also pleased to have with them several other distinguished visitors. The Institution dated back to 1864, so that it was a fairly old one. An education scheme had been introduced, so that those who were to come after them might be suitably technically equipped to perform the duties that they would be called upon to fulfil. They as an Institution were anxious to maintain the gas industry; and, as he said, they were out to make it, if possible, still more efficient. The gas industry was full of vitality instead of being, as some people thought, in a state of decay; and he ventured to declare that the next few years would witness still greater development. He had referred in his address to the great development of gas in the United States of America; and the same could be said of the industry on the Continent of Europe and in other parts of the world. The gas industry of this country, with its allied trades, had a capital of something like £200,000,000,

and provided practically permanent employment to about 125,000 men—which in these days of unemployment was something to be proud of.

SELF-HELP AS A REMEDY.

Mr. D. MILNE WATSON said it was with great pleasure that he rose to give the toast "Trade and Industry," coupling with it the name of the President of the Board of Trade, Sir P. Cunliffe-Lister. They were very pleased indeed to have him among them. At the present moment the trade of the country was going through a very bad time, and unemployment was rife. It was three times what it was before the war, and everybody was looking for a remedy. Personally, he did not believe that any miracle was going to take place to help them out of their difficulty; to his mind the remedy for the present troubles was self-help ["Hear, hear"], coupled with lower taxation. If employers and employed were prepared to make sacrifices, he did not believe the country would be long in getting trade started again on a pre-war basis. The trouble was that everyone was looking for help from outside. It rather reminded one of the family in financial stress, who sat round a table to discuss matters. The son said: "My allowance must remain the same." The daughter said: "I must have my motor-car and horses as usual." And the father ended up by saying: "I must have cigars and wine as usual." There was nothing to be said about the mother; she was always self-sacrificing. What he had portrayed was very much the position of industry at the moment. No one—either one side or the other—wanted to give up anything. But he felt perfectly certain that, until this idea was got rid of, they were never going to get straight again in this country. No speech from him would be considered complete without some reference to Scotland; and he would like to ask them: "Do you think that little tribe north of the Tweed would have come into the position of being the rulers of the world if they had not been prepared in the early days to make great sacrifices for education—if they had not been prepared to work in the summer time at the harvest, in order, during the winter time, to be able to go to the school and college? Do you think they would be occupying the position they now do all over the world if they had waited for the Carnegie Trust for education?" In a little fable by Æsop, a farmer said to his sons: "I am going to leave you a field, and in that field is hidden great treasure. If you go there, you will find that treasure." The old man in due course died, and his sons got pickaxe and spade and started to dig over the whole field, expecting to find gold and silver treasure buried in the vineyard. They never found it; but after working and cultivating, they had the best vineyard in the country, and had their reward in bountiful crops. That was the moral for this country. They must not go looking for hidden treasure. It was by work alone that this country, and its industry and trade, would get right. They were thinking too little about self-help, and too much about what Government assistance they could get.

THE CASE OF ELECTRICITY.

Take this illustration of electricity. It was said by many learned professors and many politicians that too little electricity was used in this country, and that it was too dear; and they compared the amount of electricity utilized in this country with other countries, and found that in Switzerland the figure was 700 units per head, Canada 612 units, the United States 472 units, France 147 units, Germany 141 units, and Great Britain about 139 units. It would be noticed that a certain group of countries—Switzerland, Canada, Norway, the United States, and Sweden—used a large amount of electricity, and that the three countries he had last quoted—France, Germany, and Great Britain—consumed about the same quantity. What was the reason for this? That the first group had water power, and could use this to generate electricity; whereas in this country, Germany, and France there was coal, and these coal countries were developing on a line of their own. They were not only turning a certain amount of coal into electricity, but also turning it into gas, of which they used much more, because it was the natural way in which to utilize the resources of the country. The other point was that it cost too much in this country. Well, electricity in many districts of this country cost half what it did in Switzerland. Electricity on the North-East Coast was equal in price to Chicago—a startling figure; yet in spite of this they were told that, if they obtained Government assistance and organization for electricity they were going to have less unemployment and smokeless towns. As for less unemployment, with equal rates for electricity, in Chicago trade was booming, while on the North-East Coast it was more depressed than anywhere else. How could they think that electricity had anything to do with it at all? If electricity had been given away, it would not have preserved many recent contracts for this country. It was hunting a "will o' the wisp" to say that electricity was going to solve the unemployment problem of this country. They had been told at Barking that electricity was going to purify the air. Gas had already purified the air—that was his answer. Going along King's Road, Chelsea, he happened to pass the Fulham Gas-Works, and there the air was clear and bright. Near by was the Lots Road Power Station, with the chimneys belching forth smoke. So much for the purification of the air.

LOW-TEMPERATURE CARBONIZATION.

Next he came to the question of low-temperature carbonization. It had been stated in the papers that if only the Government would give £10,000,000 low-temperature carbonization would save the country. Did they seriously think that the manufacturers and the owners of private capital in this country were such fools that if they thought £10,000,000 could have made a commercial success of it, they would not have invested it in low-temperature carbonization? Yet, apparently, there were a large number of people who believed that £10,000,000 of Government money could make a desert blossom, whereas £10,000,000 of ordinary capital could do nothing.

BRITISH TAR FOR BRITISH ROADS.

Then there was another matter of which he had read in the papers that morning. When they had a man like Sir Henry Maybury, occupying a high position in the Ministry of Transport, referring to the use of bitumen for roads, and then going on gratuitously to say: "As for tar, it sticks to everything except the road," was this a helpful thing to British industry? ["No."] It was a scandalous thing. One of the highest officials in a Government Department deliberately crabbing one of the biggest products of this country, and throwing his weight on to the side of an imported substance which cost twice as much! If they wanted to help the trade of this country, why did not they say: "Use British tar for British roads"—except for the 4 p.ct. of roads which lay along trout streams, if they liked? Even in London, trying to make them use bitumen instead of tar! It was a scandal. Could they imagine any body of Germans or Frenchmen sitting round a

LEFT TO RIGHT at Top Table: Mr. Reginald Clarry, M.P., Dr. Chas. Carpenter, C.B.E., Sir Philip Cunliffe-Lister, Mr. Ferguson Bell, Mr. J. H. Thomas, M.P., Mr. Wm. Woolley, Mr. Milne Watson, D.L., and Major-Gen. Sir R. H. Luce, M.P.

table, who would scheme how to get a foreign substance used instead of their home commodity? He would not have referred to the matter in such a way had he not felt that this adoration of what came from abroad did more harm to British trade than anything else at the present moment. [Applause.] "I believe," concluded Mr. Milne Watson, "that if we would only put our backs into it—each one and everyone—employer and employed—this country would win through. I cannot believe anything else. I couple with the toast the name of Sir Cunliffe-Lister; and I hope he will remember that gas is especially entrusted to his care."

THE PRESIDENT OF THE BOARD OF TRADE REPLIES.

Sir PHILIP CUNLIFFE-LISTER, in response, said he was very glad they had given him an opportunity of taking some small part in one meeting connected with this most interesting and valuable conference. The members of the Institution were the High Priests of a great and successful industry—an industry which was the architect of its own success. This success was founded upon skilful management, upon constant scientific research, and upon not only the direct production of their main commodity, but on valuable, and increasingly valuable, bye-products. The industry was a model of good relations between employers and employed; and it was also a model in the service which it rendered to the public. He wished really that he had as little difficulty in defending many things as he had on the whole in defending Gas Orders. As he had said, the industry was giving good service to the public; and where the industry prospered, the public, or consumers, came in and shared both in the quality of the article which they received, and in the price at which they received it. This was really a public service; it was really being a public utility undertaking. Lastly, but by no means least, the gas industry was not lacking in what he believed to-day was a matter of the most vital importance, if Britain and British trade and industry were to get the fullest value out of their assets—namely, development. In the face of the increasing output of gas—doubling, trebling, quadrupling decade after decade—anybody would be a fool who said the age of gas had passed. There could be no possible question that there was not only a great need for this industry, but a great future before it. He could promise them that at the Board of Trade they would not be unmindful of the gas industry. But this was really quite an unnecessary undertaking to give to those present, because there were millions of consumers all over the country who were the real safeguards of the interests of the industry which had served them so well in the past. It appeared to him that a great deal of the suspicion that existed to-day—he was not going to make any pronouncement upon Government schemes, for he was not in a position to do that—rested upon a profound misunderstanding of elementary facts. There were many people always prepared to talk a huge amount of nonsense about subjects with which they were largely unacquainted. He had often seen a case damned by being put too high; and from some experience of the gas industry at the offices of the Board of Trade, and some small direct experience of helping to run electricity undertakings in different parts of the world, he said that, whatever politicians of one complexion or another might urge, facts had undoubtedly established that gas and electricity were not necessarily enemies, but that both, worked at the highest efficiency, were vital to any country. He thought those present, who certainly knew more of the gas side than he himself did, would probably bear him out in this: That if they took those parts of the United States where electricity had been most ably developed, they would find gas most ably developed side by side with it; and that the people whose evidence and experience were rightly taken in this country as showing the great strides made by electricity—the very men upon whose evidence and experience this was founded—were the men who had proved in practice that the two had to be developed side by side. So far in the past when Government aid had been given, gas and electricity had been treated on absolutely identical and equal terms; and he was quite sure that any representations which the gas industry might have to make with regard to any proposals that might be put forward, would be considered at their full value, both in Government circles and by the House of Commons. This was only fair play, which they had the fullest right, not only to ask for, but to demand. But they must not spoil their rightful claim by putting it too high. Do not let them, for example, say, if in some industry—whether electricity or anything else—there was some development which was economically sound and in the interests not only of the industry but of the country at large, which was in its character and its essence applicable only to that industry, that it ought not to be put in hand, and if necessary assisted, because an identical scheme could not be prepared by the gas or other industry. If they attempted to make a case of this kind they would be seriously prejudicing the very valuable claims they had on the Government and on the country. He looked forward with great confidence to the future of the gas industry.

SERIOUS TRADE POSITION.

The toast was not only to the gas industry, but to the trade and commerce of the country; and he wished he could take at this moment an equally hopeful view of all the other industries as he did of gas. If they could show the same advance and the same prospects, if they had only to face the same competition, he should be greatly more hopeful of their future than he was that day. The trade position was unquestionably serious; and it was no use blinking facts. It was serious because they were doing too little business—far too little business—for the population they had to support. There was something about the matter, too, that was not seen in any official return, but which every trader was aware of—and that was the diminishing margin upon which a great deal of this business was being done. In many cases it was at an actual loss; and this was serious. There was another thing that was serious—namely, the disparity between this country's imports and exports. The need was to develop new markets; and this meant that they must have more money to invest. The greater the deficit to be made up in the trade balance, the less there was to invest. This was why it was so tremendously important to restore that balance, and to show a more favourable margin at the end of this year than at the end of last year. This led him to refer to one matter that had been mentioned by Mr. Milne Watson. It was vitally important, whenever they were considering the use of any commodity in this country that was made outside this country, that they should count the cost of importing it, and see whether they could not make the article themselves. It was not only that they were giving more employment in this country by using the home article.

TAR OR BITUMEN.

In the particular case Mr. Milne Watson took, they were not only helping the gas industry, but they were helping coal, which was a most distressed industry. It was not only direct employment they were giving; but if they could diminish the imports, they would be increasing the trade balance, and giving themselves more money to invest. Therefore they should think, not once, but twice before giving preference to what had to be paid for by exports over the article which could be purchased at home. "Without expressing an expert judgment in this controversy," proceeded Sir Cunliffe-Lister, "I should like, purely for the sake of information, to know whether those roads of Kent, which were, I understand, the glory of that county, and the expenditure on which was such a good investment, and which have been the precedent for many great extensions and developments throughout our land, at no small outlay of public money—whether those roads did not attain to their perfection by the use of the despised tar, and not bitumen."

Dr. CARPENTER: I have been motoring for twenty years on the Kent roads. When Sir Henry Maybury was the Engineer upon these roads (on which he was one of the first to use tar), they were model roads. There are many who can speak in support of that.

Sir CUNLIFFE-LISTER (continuing) said he did think it was of enormous importance that a decision should not be come to in a case of this kind, where public money was involved, where employment of British industry was involved, without making quite sure that they could not get, by working to specification, an article which was for the purpose about as good as the thing which they would have to pay for twice over. He hoped that this question might be considered upon its merits, and with due regard to national interests; and that they would try to act, all of them—everybody concerned—in the best interests of the trade of the country.

WORK, AND WORK, AND MORE WORK.

To resume the main theme of his argument, he quite agreed that it was vitally important to-day that people should face facts; and he believed that really they wanted to be told the naked truth. He did not think they desired any concealment. They should have the courage to give British people and British industry the true facts. In every industry both parties were prepared to face facts with all the cards on the table. Difficult as the position was to-day, he was optimist enough to believe in the enterprise, initiative, and capacity of the British people—to believe that they could surmount all their obstacles. The Government would help in every way it could; but there were strict limits to what the Government could do. It could work for settlement abroad; but if stability abroad was important, more important still was settlement at home. It was necessary to avoid "stunts" and costly short cuts, and to study markets. "We have," Sir Cunliffe-Lister concluded, "the best raw material in men that any country has got. We have got to-day throughout our universities as good a training as you can find anywhere else for these men. Let us use those assets. Experience we have; credit we have, second to none. Quality, financial ability—tremendous assets for any industry and any country. Let us make the most of them. In a word, it comes back to what Mr. Milne Watson said—the greatest need for all is work, and work, and more work. We want goodwill and confidence, individual enterprise, and initiative, and at the same time everybody playing for the side." [Applause.]

KINDRED INSTITUTIONS.

Dr. CHARLES CARPENTER submitted "Kindred Institutions." He said he remembered fifty years ago his chemistry master and his old friend disabusing him of the idea that there was much honour to be attached to membership of learned societies. He said then that there was only one to which membership could not be obtained either by purchase or by favour. In the

half-century which had since elapsed, many changes had come about; and he thought they owed a great debt of gratitude to the parent society—to the Institution of Civil Engineers—who had so long lived up to that high ideal of membership as the result of examination. In other words, the application of a test to those desirous of passing through its portals. He was sorry, therefore, to find that his dear old friend the President of the Institution of Civil Engineers was not with them, so that some acknowledgment might have been made of the great work at which he had assisted in this direction. He (Dr. Carpenter) thought they might also take the opportunity of expressing their condolence at the lack of respect which the average public, the average press, and he might say the average authorities, gave to the leadership of the Institution of Civil Engineers. He could not think of any other civilized community among whom less regard was paid to the specialized knowledge of professional men than in this country. The fact of the matter, he thought, was that there were far too many amateur opinions being advertised to-day, to which a certain amount of weight and notoriety were being attached. For the President of the Institution of Civil Engineers they had an admirable substitute in their old friend Sir Dugald Clerk, to whom the gas industry owed a great debt of gratitude for the manner in which he had, clearly and fairly, set out the pros and cons of the coal question as applied to the distribution of energy. His only regret was that this work was not more widely known, or that the great store of facts was not more often drawn upon. They had also with them Mr. W. H. Patchell, representing the Institution of Mechanical Engineers. The foundation of the gas industry was mechanical engineering. It was by the knowledge of mechanical engineers that the business of gas making had been developed. It was perfectly true that now they called in more and more the assistance of the chemist in working out those problems the solution of which was so essential to their development; but even then the business was largely a question of mechanical engineering. They therefore owed very much to the Institution of Mechanical Engineers.

Sir DUGALD CLERK (Past-President and honorary member of the Institution of Gas Engineers, and Past-President of the Society of British Gas Industries), on behalf of the Institution of Civil Engineers, and Mr. W. H. PATCHELL (Past-President of the Institution of Mechanical Engineers), acknowledged the toast. The latter remarked that there was one man in the room —Mr. F. W. Goodenough—who had done more than anyone else in this country to make consumers realize that they were getting service.

THE VISITORS.

Mr. SAMUEL TAGG proposed "The Visitors;" remarking that if there was one lesson the war had taught them it was the value of publicity. With the growth of the gas industry, it had come to be realized that it was one of the essential industries of the country. It was dependent on other industries, and it was also dependent on securing the support of the community—support which could only be based on a knowledge of the work it was doing. Therefore they welcomed the presence of visitors with them that day.

Major-General Sir R. H. LUCE, replying, said he was glad to have an opportunity of telling them how much they appreciated Mr. Bell in Derby—not only as a first-rate gas engineer, but as a citizen who took the greatest interest in the town. Certainly they had a most excellent gas service. As a member of the Town Council, too, he put in very good work.

Mr. REGINALD G. CLARRY, who also replied, said he did not really regard himself as a visitor, but more as enjoying a happy re-union with some very old colleagues. His letter-bag told him that there was a great deal of apprehension in the gas industry as to what might take place in the future in the matter of State pampering of the rival industry. It seemed to him that the anxiety was justified; and it was better that anxiety should be manifested now than after legislation had been passed. Reference had been made to low-temperature carbonization. Though this was not at the moment what one might regard as a commercial proposition, yet developments were taking place. He would advise gas engineers to keep closely in touch with all developments of low-temperature carbonization of coal—particularly from the national point of view of the production of oil. Oil could be produced from coal by various processes; and he thought the right place for doing it was at the gas-works. ["Hear, hear."] If at the birth of electricity the gas industry had taken the view that the right place for its production was at the gas-works, the minds of the members would not have been filled with the anxiety that occupied them at the present time. The gas industry had rendered great service, and had a bright future before it; but whatever they did, they must not hide their light under the bushel of public misapprehension. They must let people know what they stood for—that the gas industry was the greatest industry for the conservation of coal—and then he felt sure they would maintain in the future the excellent record that they had set-up in the past.

AT DERBY—THE PRESIDENT'S HEADQUARTERS.

On Friday morning, just before 9 o'clock, the majority of the large contingent of *congressistes* and their wives assembled at St. Pancras for the last social event of the week—the visit to their President's town and its beautiful countryside, and enjoyment of the hospitality of the Chairman and Directors of the Derby Gas Light and Coke Company. The train was a "Wembley Special," and the accommodation thereon and the attendance provided left nothing to be desired. The two-and-a-half-hour journey was soon over, and the visitors found themselves marshalled into waiting tramcars, which conveyed them to the selected one of four destinations—the locomotive works of the L.M. & S. Railway, the carriage and wagon works, the gas offices and Cavendish Street Gas-Works, or the Royal Crown Derby Porcelain Works.

At the locomotive works there was a wealth of interest—the boiler and firebox plating and testing, the forging of link-motion parts, the erecting, and the immaculate painting and many other of the processes which combine to make the modern locomotive the thing of beauty which it is. At the carriage and wagon works it was difficult to imagine that the trade barometer is at its lowest, for they are turning out some 200 wagons a week, and the carriage shops are full. The rough tree sections were passing into the Canadian mill at one end, and the machined and fitted parts of wagons were being delivered in a continual stream at the other end; the sawn planks being subjected to a multiplicity of processes at almost incredible speed—such is the effect of intermediate mechanical handling and workman on piece rates! At the Royal Crown Derby Works the party, mostly ladies, evinced the keenest interest in the skill and precision which produce the world famous porcelain. They were surprised to learn that a piece is at least six weeks in the making, and that it is six times fired for 60 hours, to fix the beautiful colours which characterize it.

As for the works, offices, and showrooms of the Derby Gas Light and Coke Company, we must refer our readers for a description of these to the reprint of the handsome souvenir brochure and illustrations on page 956. In selecting our ticket for the visit, we noticed that it was planned to proceed from the carriage works to the Litchurch Gas-Works; but time did not permit of this, and several of the party were disappointed not to see certain installations—among them the new sulphate plant by the Chemical Engineering and Wilton's

THE PARTY WHICH VISITED THE LOCOMOTIVE WORKS.

Patent Furnace Company. This embodies several novel features, and the Engineer of the station, Mr. Fisher, is entertaining great hopes of its working.

The Luncheon.

The luncheon offered by the Derby Gas Light and Coke Company was served in the Drill Hall, as the Assembly Rooms, which were originally intended for the function, could not accommodate the exceptional number who accepted the invitation. No fewer than 390 sat down to a luncheon which was excellently served.

Mr. William Woolley (Chairman of Directors), with whom was Mrs. Woolley, presided; and with him at the table of honour were: Alderman W. Hart, Lt.-Col. G. A. Strutt, Mr. E. S. Johnson, Mr. M. Attwood (Directors); Mr. and Mrs. J. Ferguson Bell, Mr. C. F. Botley (President-Elect) and Mrs. Botley, Sir Albert and Lady Ball, the Lord Mayor of Manchester (Alderman F. J. West) and Miss West, Sir Henry Fowler, K.B.E. (Deputy Chief Mechanical Engineer, L.M. & S. Railway) and Lady Fowler, Mr. J. H. Follows, C.B.E. (Chief General Superintendent, L.M. & S. Railway) and Mrs. Follows, Mr. Frank Tatlow (late General Manager of the Midland Railway) and Mrs. Tatlow, the Mayor of Halifax, the Mayor and Mayoress of Derby (Mr. and Mrs. Allen Mycroft), Mr. G. Trevelyan Lee (Town Clerk), Dr. Brindley (Medical Officer of Health), Mr. J. W. Horton (County Surveyor), Dr. Laurie,

Mr. Bell Chatting to Mr. J. H. Follows, C.B.E., Chief General Superintendent of the L.M. & S. Railway.

Mr. and Mrs. Thomas Hardie, Mr. and Mrs. W. Doig Gibb, Mr. and Mrs. Madden, Mr. John Peacock, and Mr. W. Moore (President of the Derby Chamber of Commerce).

The Loyal Toast having been duly honoured, Mr. William Woolley rose to say that he had been pressed for a few words, although it had been arranged that there should be no speech-making. He was content to feel that by their very presence their guests thanked the Derby Gas Light and Coke Company for the entertainment. The Directors were exceedingly glad to welcome them, and it had been a real source of pleasure to do so—to know each other better—for they were all interested in one particular industry. He trusted that they had learned something from their visit to Derby Gas-Works, and to the great works of the L.M. & S. Railway, of which Derby was so proud. He felt sure that, when they departed that evening, they would carry with them the same high opinions as they had freely expressed that week in London of the Chief Engineer of the Company.

Chatsworth.

The afternoon drive was to have been to Haddon Hall, but owing to the regrettable fire which recently destroyed the tea-rooms and other parts of the property, the arrangements had to

MR. WILLIAM WOOLLEY.
Chairman of the Derby Gas Light and Coke Company.

be altered; and by the courtesy of the Duke of Devonshire, an intellectual and æsthetic treat was provided in the form of a visit to Chatsworth. The brilliant weather of the week held out, though a storm was threatening and there was a heat mist which impaired the view of this beautiful countryside. Highly qualified guides explained as much about the wonderful treasures of Chatsworth as time would allow; and then the motor coaches took us to Bakewell. Thence the special train journeyed to Derby, and then to London; and thus closed a memorable day.

One thing must not be forgotten—to record the gratitude which was everywhere expressed for the hospitality of the Derby Gas Light and Coke Company and the infinite pains which Mr. Ferguson Bell, his assistants, and staff must have taken in organizing the details of the excursion and looking to the comfort of everybody. In this regard we would specially mention Mr. Harry Clark, the Distribution Superintendent, which brings to mind that the Derby Company have this year provided a President not only for the Institution of Gas Engineers, but for the Midland Junior Gas Association, a fact of which they are duly proud.

MR. H. BULLIVANT, F.C.I.S.
Secretary to the Derby Gas Light and Coke Company.

LEFT TO RIGHT: Mr. C. F. Botley, Miss Bell, the President, Capt. H. M. Haywood (Chief of Police, Derby), Mr. W. E. Price, Mr. E. S. Johnson, Mr. W. T. Dunn.

LEFT TO RIGHT: The Mayor of Derby, the Lord Mayor of Manchester (Alderman Fred. West), Sir Henry Fowler, K.B.E., and the Misses Bell.

A LINK WITH THE PAST.

An interesting letter, including the following statements, has been addressed to the British Empire Gas Exhibit Committee by Mrs. Clara Branson, who before her marriage was Miss Heard:

> I trust you will pardon the liberty I have taken in addressing you; but I have been deeply interested in the reading of the statements made concerning the "Spirit of Coal," gas, in the Palace of Industry at Wembley—shown as a world-wide servant—and the benefits it renders in the home and in business. It plays a great part in providing the necessities, utilities, and luxuries of modern life, and in one-hundred-and-one purposes of domestic use.
>
> You may be interested to know that I am still living—a link with the past—at the age of 81, and am a daughter of Edward Heard, a practical chemist, who did such noble work, which has benefited the public life up to the present moment of time—he being the original discoverer of the purification of gas, which he patented in 1806. He was engaged by a Mr. Winsor, in the year 1804, to deliver lectures in the Lyceum Theatre in London, on "The Application of Coal Gas to the Purposes of Artificial Light." After a series of experiments, he discovered the cause of the offensive odour which (and its irrespirability) rendered coal gas unfit for domestic use; and having proved its efficacy, he took out a patent. This passed the Great Seal in June, 1806, he having been allowed six months to specify, which specification I still have in my possession, with other papers concerning it. It can be seen at any time.
>
> Some years ago my mother received a visit from Mr. Walter King, of Bolt Court, and Mr. Thomas Berridge, Gas Manager at that time at Leamington, who could (were they living) vouch for the truth of what I assert, and kindly placed a stone upon her grave at Kenilworth.
>
> I have given a brief note of a great service rendered to mankind; and although there have been progressive strides in connection with the said discovery, it still lives, and is appreciated in the world as one of the great masterpieces of science.

INSTITUTION BENEVOLENT FUND.

The Annual General Meeting of the Benevolent Fund was held on Wednesday morning, the attendance being very small. Mr. J. FERGUSON BELL was in the chair.

The minutes of the previous meeting were read and confirmed.

The HON. SECRETARY then read the following.

REPORT OF THE COMMITTEE OF MANAGEMENT FOR THE YEAR 1924-1925.

The income for the year ended Dec. 31, 1924, amounted to £534 10s., and was derived from the following sources: Subscriptions, £272 4s.; donations, £89 12s. 8d.; interest on investments, £138 16s. 2d.; interest on deposit account, £3 3s. 10d.; and recovery of income-tax, £30 3s. 4d.

In assistance to widows, orphans, and aged members the sum of £489 18s. was granted. Printing and stationery cost £31 0s. 6d.; postage, receipt stamps, &c., £7 14s. 7d., leaving a credit balance for the year of £5 16s. 11d. (as against a credit balance for the year 1923 of £236 4s. 9d.).

The response to the special appeal issued by the President of the Institution, Mr. J. Ferguson Bell, has resulted as follows:

New annual subscriptions	£10	3	6
Special contributions, or additional to annual subscriptions	47	11	0
Donations (including donation per the Redditch Gas Company of £25) ...	41	5	6
	£99	0	0

The Committee have already, for the year 1925, voted in grants the sum of £517. The corresponding amount for last year was £489 18s The sum voted, of course, is irrespective of any applications which may arise from new cases which may come in.

Indeed, just as this report was being prepared, a fresh application for assistance was received from an aged former member of the Institution, in response to which the Committee are voting the sum of £20.

A copy of the accounts for the year 1924, compared with those for the previous year, duly audited by Mr. S. Y. Shoubridge and Messrs. Wood, Drew, & Co., has already been issued to every member of the Institution.

The two members of the Committee retiring by rotation after the usual three years of service are Mr. Ralph E. Gibson, of Liverpool, and Mr. E. George Hutchinson, of Westgate-on-Sea. To serve in their places the Committee have nominated for election at the annual meeting of the contributors Mr. Ralph Halkett, of Sheffield, and Mr. C. S. Shapley, of Leeds.

The PRESIDENT: You have heard the Report of the Committee for the past year, and I think you will agree that on the whole it is eminently satisfactory. I should like again to express my thanks to those members who were good enough to respond to my appeal, which resulted in an immediate increase in the funds of £99. As I intimated yesterday, the Lord Mayor of Manchester has been good enough to say that he will give a donation of £100, and that is also to the good. This Benevolent Fund does an enormous amount of good work. We received only two or three weeks ago an application from one of our aged members who is in the infirmary and has had an operation; and the result was that we decided to send him at once £10 and a further £10 later on. We could multiply these cases almost innumerably, where the assistance given through the Fund has made all the difference between living reasonably and being on the verge of starvation. The Fund was established so that those who suffer from reverses through no fault of their own, or the dependants of those who are unfortunately taken away, may be assisted. I do not think there is any more beneficial fund of the Institution than this one, and I am extremely glad to know that the members of the Institution are realizing the good work the Fund is doing and that subscriptions are being increased. I would, however, like to emphasize this point. It is not every member who can give large sums, but all can give from 5s. upwards, and I should be extremely glad if every member of the Institution will say "I am going to be a subscriber to the Fund, even if it is only a small amount." The Evening Star Lodge, which generally holds an Emergency Meeting on the Monday evening before our meeting, have in their Charity Box subscribed £14 2s. 6d. I am sure that I am voicing the opinion of the members in saying that we are extremely obliged to them and to the other donors for their great assistance.

Mr. SAMUEL GLOVER: I should like to thank the Chairman for his kindly explanation of the position of the Fund. When the Secretary was reading the Report, he said that a sum of £20 had been given in a recent case, but the Chairman in the course of his remarks showed how this £20 is being given in a somewhat unusual manner. We as members are very glad to know that your kind heart and the kind hearts of those who with you have been looking after this Fund for us, has been warmed towards the work you are able to do in this manner. I know, Mr. Chairman, the very warm place which this Fund has in your heart, and how glad you are that the engineers who are able to do so subscribe to it, and so enable this good work to be carried on for the benefit of those who are in need. I hope that the Fund will continue to prosper. Perhaps I might ask how the £100 from our new honorary member, the Lord Mayor of Manchester, is to be disposed of. You said it was given as a donation, and I should like to know that it will be placed to capital account and will be treated as a source of income for the Fund and not be disposed of in grants. I again thank the Chairman for his very helpful review of the situation, and I have much pleasure in moving that the Report be adopted.

The CHAIRMAN: With reference to the £100 donation from the Lord Mayor of Manchester, at the meeting of the Benevolent Fund Committee this morning it was decided to invest it in War Bonds, so that about £5 a year will come in as income to the Fund.

Mr. WATSON: I should like the privilege of seconding the motion, and I do so with sincere feelings, because I appreciate the help the Committee have given in a case in which I have been interested during the past few months; and I know how much the grant which the Committee have given in that case will be appreciated. This is the second case in which I have been interested, and I do not think I have ever appreciated so much the peculiar necessities under which a past member of the Institution has been placed and has benefited from the Fund. I feel sure that, if such cases were brought in the abstract to the notice of the members of the Institution generally, we should get greater help, perhaps, than we are getting. In this connection I would like to make a suggestion. I do not know whether it will meet with the views of the Council of the Institution of Gas Engineers; but in view of the scanty attendance that we have here this morning, it occurs to me that it might be well worth while holding this meeting in the middle of the proceedings of the Institution itself ["Hear, hear"] about midway in one of the morning meetings, even if the Institution proceedings were suspended for ten minutes or a quarter of an hour. You would then have a very much larger attendance of the members of the Institution, and particularly of those members who are not subscribers to the Fund. I have much pleasure in seconding the motion for the adoption of the Report.

The CHAIRMAN: The report is now open for discussion.

As there are no comments, I will only say that since I entered the room this morning I have received a donation of £1 from Mr. M'Lusky, of Halifax, bringing the result of the Special Appeal up to £100. [Applause.]

The report was adopted.

The CHAIRMAN: We have now to appoint a Trustee in the place of the late Mr. H. E. Jones. The Committee looked round to see who would be the right gentleman to nominate; and there occurred to me the Governor of the Gas Light and Coke Company (Mr. Milne Watson), who is also President of the Gas Council, and, as you know, is very actively associated with all that concerns the gas industry. I approached Mr. Milne Watson, and asked him if he would be good enough to take Mr. Jones' place, and he said that, if it were the wish of the members, he would be very pleased to do so. I brought that before the Benevolent Fund Committee, and they unanimously agreed to ask Mr. Milne Watson to be Trustee. Mr. Dunn communicated that decision to Mr. Milne Watson, and he has written expressing his pleasure in accepting the nomination.

On the proposal of the CHAIRMAN, seconded by Mr. SAMUEL GLOVER, Mr. Milne Watson was unanimously elected a Trustee.

The CHAIRMAN then announced that Mr. Ralph Halkett (Sheffield) and Mr. Charles S. Shapley (Leeds) had been elected by ballot to succeed Messrs. R. E. Gibson (Liverpool) and Mr. E. G. Hutchinson (Westgate-on-Sea), who retire by rotation.

This closed the Benevolent Fund meeting.

EDUCATION SCHEME.

REPORT OF THE ADVISORY COMMITTEE FOR THE YEAR 1924-25.

Adopted by the Committee, May 12, 1925.

The year 1923-24 was fittingly described as a year of foundation laying. That of 1924-25 may be spoken of as one of steady, painstaking building. Brick has been added to brick, and a structure is beginning to take shape. Progress has been slow, but it is hoped all the more sure because of the care taken. Last year it was possible to report only 11 centres at which organized instruction in gas subjects was being given. This year the number has increased to 21 (as per list appended), while there are two other centres at which the earlier parts of approved courses are being taken.

Other applications for the approval of Courses of Instruction are known to be pending, so that it is hoped that the list may be extended in time for the session of 1925-26.

Last year, only 4 centres were in a position to present students for examination. This year 54 candidates are coming up from 8 centres.

The number applying for examination shows a gratifying increase in regard both to external and internal candidates.

The comparative figures are :—

	1923-24.	1924-25.
Internal Students ..	... 36	... 54
External Students ...	... 24	... 56
	60	110

Having regard to the increased number of centres at which courses under the Institution Scheme are now being taken, and to the fact that this will be the last year in which the educational work of the Institution and that of the City and Guilds of London Institute will overlap, it may be anticipated confidently that next year the numbers applying for examination under the Institution Scheme will be considerably increased.

An illuminating side-light on the great need there was for the Institution to take up this work is afforded by the fact that no less than 30 applications to sit for examination had to be refused owing to the students' lack of preliminary scientific training. The fact of these applications being made reveals a desire, on the part of the students, for the advantages the scheme confers, while it is most unlikely that so many would have had to be refused for the present had a satisfactory education scheme been in operation for a longer period.

In considering the applications in question, the Committee has been anxious to deal as sympathetically as possible with every case on its merits, while on the other hand maintaining the high standard which the times and the industry demand. It is satisfactory, therefore, to note that the decisions of the Committee in those cases, unwelcome as they have naturally been, have been loyally accepted, and that the students have seriously set themselves to repair those defects in their fundamental training which have been pointed out to them.

The year has been marked by several outstanding features of interest. It is gratifying to report that both the Ministry of Education for Northern Ireland and the Department of Education for the Irish Free State have accepted the scheme, have appointed representatives to the Central Advisory Committee, and have signified their willingness to co-operate in every way in applying the scheme in their respective areas of administration.

A development of great promise for the smooth working of the scheme is the appointment of Committees of Advice for both Wales and Scotland. These are intended particularly to assist and advise as to his best method of procedure the student who is situated at a distance from educational centres. Moreover, courses of instruction vary so much in the Technical Institutes and Science Schools of the United Kingdom that students are often in considerable doubt as to the best plan of study in their particular circumstances. These local and personal difficulties can undoubtedly best be solved by those familiar with the precise circumstances and conditions which give rise to them; and it is hoped that these Committees of Advice in Wales and Scotland will be appreciated and utilized by many students.

It is with satisfaction we report that a liaison has now been established between the educational work of the Institution and that of our Universities. A graduate possessing an approved degree in Gas Engineering taken in a British University is now exempt from the written portion of the Diploma examinations, but is required to submit a thesis, present himself for oral examination, and satisfy the Advisory Committee as to his professional experience.

Reference has been made to the elimination of the overlapping of the Institution's Education Scheme with the work of the City and Guilds of London Institute. This has been made possible by the thorough revision of the whole of the work of technical education within the industry. As a result of an interview between the Advisory Committee and representatives of the City and Guilds of London Institute, a Committee was set up to consider the whole question. This resulted in—

1. The adoption of a grouped Course for Gas Fitters;
2. The establishment of what have been designated Minor Grouped Courses in (*a*) Gas-Works Practice, and (*b*) Gas Supply Practice, for those unable or not desiring to take the "professional" Courses of the Institution Scheme.

In the establishment and operation of these courses—whereby the Education scheme has been extended so as to provide for all grades of those engaged in the industry—the Advisory Committee and the City and Guilds of London Institute are working in the closest co-operation. Complete syllabuses have been drawn up, and are now embodied with the particulars of the "Major" Courses in the Regulations issued by the Institution, copies of which may be obtained on application to the Secretary, 28, Grosvenor Gardens, Westminster, S.W. 1. The value of the certificates gained in connection with the "Minor" Courses will be considerably increased through their being endorsed by the Institution.

It was with great regret that early in the year the Committee received the resignation, owing to ill-health, of Mr. J. Wesley Whimster as one of the Examiners in Gas Supply. It was at the same time decided to increase the representation of the North on the Board of Examiners by the addition of another member. Mr. George Keillor, of Greenock, and Mr. R. B. Roxburgh, of Newcastle-on-Tyne, were therefore elected to fill the vacant positions.

APPENDIX.

LIST OF SCHOOLS AND COLLEGES GIVING "COURSE" INSTRUCTION UNDER THE SCHEME OF THE INSTITUTION OF GAS ENGINEERS.

Bath Municipal Technical College.
Barnsley Technical School.
Birmingham Municipal Technical School.
Coventry Technical Institute } For early years of Course only.
Wolverhampton Technical College }
Blackburn Municipal Technical College.
Bournemouth Municipal College.
Bradford Technical College.
Bristol: Merchant Venturers Technical College.
Burnley Municipal College.
Coventry (see Birmingham).
Derby Municipal Technical College.
Dewsbury Technical College.
Glasgow Royal Technical College.
Halifax Municipal Technical College.
Huddersfield Technical College.
Leeds Central Technical School.
London: Regent Street Polytechnic.
Westminster Technical Institute.
Manchester Municipal College of Technology.
Plymouth Municipal Technical School.
Portsmouth Technical College.
Salford Royal Technical College.
Stoke-on-Trent Central School of Science and Technology.
Wolverhampton (see Birmingham).

The PRESIDENT: I have the very greatest pleasure in asking our good friend Mr. Goodenough to present the Report of the Education Committee.

Mr. F. W. GOODENOUGH: In presenting on their behalf the Education Committee's report for the past year, I should like to call the attention of members to one or two points. First let me say that, while the Committee are glad to see the in-

crease in students presenting themselves for examination—namely, from 60 last year to 110 this year—they regard the latter figure as very far below the number they hope to see taking the examinations in years to come. One student for examination to 8 statutory gas undertakings in the kingdom—one to 14 of all the gas undertakings of the country—is a very low figure. It is certain to increase as the arrangements made for courses in Gas Engineering and Supply at the various centres get into full working order; and members will have observed with satisfaction the considerable increase in the number of centres at which such courses have been arranged. But something more than the establishment of courses at numerous centres is necessary before we can hope to get the number of young men there ought to be, throughout the country, qualifying themselves for promotion and fitting themselves for raising the standard of knowledge and efficiency in the industry. Gas undertakings everywhere should, definitely and practically, support the scheme of the Institution, adopt it as part of their own plans for building up staff, make it well known to everyone in their employment, and not only encourage, but assist, would-be students to take-up courses, both by liberal treatment in regard to travelling expenses and to time-off for attending the necessary classes, and by adequate recognition of success in the examinations. The industry needs, and as competition becomes more and more keen will more and more need, well-educated staffs—not only technicians and scientists in the works and laboratories, but also representatives with both technical knowledge and commercial capacity on the districts. Gas undertakings must create the demand for better human material by paying qualified men good salaries and by being prepared to pay still better salaries as men become better qualified. The machinery for assisting men to improve their qualifications now exists, and is being steadily improved as experience proves necessary—for we do not regard the scheme as stereotyped, but as open to amendment always. We believe the men exist who are anxious to qualify for advancement. It is for the industry to make it clear that better qualified men are wanted, and will be paid for according to value.

On this point of the men being willing or unwilling to work earnestly for their better qualification if they are encouraged to do so, I should like, if I may in passing, to enter a protest here against the sweeping attack on the present generation of young men made by Dr. Arthur Shadwell in "The Times" last Wednesday. Writing with that air of omniscience and authority so often assumed by the literary onlooker (who by no means always sees most of the game of business, because he has never played it, and knows little of those who do), Dr. Shadwell roundly states that "there is really something wrong with the present generation; they neither work well nor play well. They seem altogether lacking in energy and serious purpose. . . . And this holds good," he adds, "of all classes; they are all crazy for amusement and show."

Well, I am sure you will agree with me that it simply is not true that our young men neither work well nor play well. Of course they are not all paragons of virtue and diligence; but when we have large numbers of men working for us who are ready and willing to give up three at least and often more evenings a week to attend science and other classes, and travel considerable distances to do so, and many more are constantly putting in long hours on their companies' work without a murmur—keen on their business and on their studies, as well as keen on their sports—it makes one resent warmly such superficial criticism as that I have quoted.

And we in more responsible positions are regarded as decadents unworthy of our forebears, because we play golf on Saturday mornings—sometimes—or go away for the week-end on Friday nights. If some of our arm-chair critics could realize how the labour-saving machinery of modern business life has increased the hourly output of nervous energy by those in administrative positions, they would hold their tongues, or talk sense. Very few people probably realize the extent to which the telegraph, the telephone, the shorthand-typist, the dictaphone, the motor car, have combined to make it possible for a manager to-day to do actually three times as much work in an hour as could his most diligent grandfather, and how in so doing he uses up so much nervous energy as to make it imperative that he should have longer time for re-creation (using the word in its truest sense) than was necessary for the manager working at the lower pressure of former days.

This digression is, I suggest, not altogether irrelevant to my task of presenting our report on Education. If the present and future generations are both to work well and to play well, as we believe they wish and are prepared to do, and to carry this great industry through present contests to future victories, and to increase its power of serving the nation with satisfaction and profit, they must be given every encouragement to get themselves well educated under conditions that do not put upon them too great a nervous strain. We of the Committee are therefore anxious to arouse fully the interest, and enlist fully the help, of every member of the Institution in the steps that are being taken to make it possible for every man to get the education he needs.

This brings me to two other points we desire to stress. The first is that, to make the Institution scheme meet the needs of as large a number as possible of the men in the industry who feel the desire for further education, we have organized, and added to the scheme, what are called the "minor grouped courses" in Gas-Works Practice and Gas Supply Practice. These are designed mainly to fit the needs of those (and there are many) in the industry who do not aspire, or who are not able, either to become professional men of such knowledge and experience as would enable them to obtain Higher Certificates or Diplomas in Gas Engineering or Supply, or craftsmen as highly qualified as those able to pass the practical examinations in gas fitting, yet are keen to demonstrate that they possess a good general knowledge of the practical operations of the industry in which they are employed, and are thereby better qualified to perform the duties on which they are engaged, whatever those duties may be. We believe that by thus providing for three general categories of students—who may be classified as (*a*) professional men, (*b*) craftsmen, and (*c*) those who are neither the one nor the other, but should understand the operations of both—the scheme has been considerably improved; that it will draw to itself an increased number of students; and that it will secure the active interest and support of an increased number of the boards and committees, as well as managers, of gas-works throughout the country.

The other point we wish to emphasize is that we have done, and will do, everything we possibly can to make the scheme available for every man in the industry who desires to take advantage of it; but that our desire so to do must always be governed and limited by the paramount need of maintaining such a standard of study and instruction required from every student as shall ensure that the possession of certificates and diplomas granted by the Institution and endorsed by the Board of Education shall testify beyond doubt that the holders have reached definite standards of knowledge, training, and experience. Employer and employed alike must be able to feel confident that a certificate or diploma means, and is known to mean, something definite and practical in relation to the holder; or the scheme will fail of its prime object. So clear are the Committee on that point, so certain are they that, in maintaining—and, in the course of time, raising—the standard of value of the certificates and diplomas, they have the full support and mandate of the members of the Institution, that they are obliged to have that consideration always in mind in adjudicating upon the qualifications of students to sit for examination. Especially in these early days of the working of the scheme, the Committee are anxious to err, if they err at all, in favour of the would-be candidate; and they have accepted some on the border line who in later years they would certainly reject. This is what they desire that all members should know; and they desire to say that no one more regrets the refusal of admission to examination of a student than they do. The value of the certificate, however, now and in the future, must always be the prime consideration.

Those who represent the Institution on the Committee desire to put on record their great appreciation of the assistance rendered to them so readily and generously at all times by the members representing the Education Authorities. Those representatives could not be more devoted to the service of the scheme if they were actually engaged in the industry; and their knowledge and experience are invaluable. Finally, let me say that all members of the Committee appreciate, as I am sure all members of the Institution appreciate, the work done by the Board of Examiners, whose task is neither easy nor light, and who perform it in a spirit beyond praise—words equally true of our Organizing Secretary, Mr. Walter Hole, who lives for the scheme and for those it is designed to assist, and who spares neither time nor energy in its service.

I beg to move the adoption of the report.

Mr. Samuel Tagg: I have very great pleasure in seconding the adoption of the report. I need say nothing more than endorse the appeal which the Chairman of the Committee has made for the support and co-operation of the engineers and undertakings throughout the country to make for the proper utilization of the scheme which has been prepared and which has been designed, as far as possible, to meet every conceivable condition which obtains in different parts of the country. I should also like to endorse his reference to the invaluable work of the members of the Education Authorities on the Committee. I think there is no Committee of the Institution which has done more work than the Education Committee.

The President: The report is now open for discussion. I am sure we of the Institution feel very much indebted to the Education Committee—and especially the Chairman—for the great amount of work which they have put into this scheme. It is for the members of the Institution to show their appreciation of the work which has been done; and you can best do this by getting those connected with your undertakings to take advantage of the scheme. It is absolutely necessary, if we, as an industry, are to maintain our position, to have men trained technically; and this scheme has been thought out, as I mentioned in my Address, with this object in view. It is receiving the support of the various Education Authorities, and I do hope that members will support the scheme as it really deserves. The opening remarks of the Chairman of the Committee, Mr. Goodenough, have so completely covered the ground that it seems there are no questions to be asked.

The report was adopted.

THIRTEENTH REPORT OF THE RESEARCH SUB-COMMITTEE OF THE GAS INVESTIGATION COMMITTEE OF THE INSTITUTION OF GAS ENGINEERS.

I. AERATION OF LIGHTING BURNERS. II. DETERMINATION OF SPECIFIC GRAVITY OF GASES.

Adopted by the Gas Investigation Committee, May 21, 1925.

RESEARCH SUB-COMMITTEE.

Chairman: Emeritus Professor Arthur Smithells, C.M.G., D.Sc., F.R.S., Director of the Salter's Institute.

Representatives of the University of Leeds: Professor J. W. Cobb, C.B.E., B.Sc., F.I.C. (Honorary Secretary), Emeritus Professor J. B. Cohen, Ph.D., D.Sc., F.R.S., Mr. G. R. Thompson, B.Sc. (One vacancy.)

Representatives of the Institution of Gas Engineers: Messrs. J. Bond, O.B.E., T. Glover, C.B.E., M.Inst.C.E., H. Pooley, M.Inst.C.E., S. Tagg, M.Inst.C.E., and C. Wood, O.B.E. Mr. C. S. Shapley was co-opted a member of the Research Sub-Committee for the purpose and period of research work at the Leeds Gas-Works.

Research Chemists: James W. Wood, M.Sc. (Tech.), A.I.C., A. Parker, D.Sc. (Birmingham), M.Sc. (Manc.), F.I.C.

Research Assistants: H. Kerr, A.I.C., Diploma Fuel and Metallurgy (Leeds), G. B. Howarth, M.Sc., Gas Engineering (Leeds), A.I.C., and A. C. Monkhouse, Ph.D. (Leeds), B.Sc., A.I.C.

INTRODUCTION.

The constitution of the Gas Heating, Lighting, and Ventilation Research Committee has not changed during the year, and it has continued to act under the Chairmanship of Professor Smithells as the Gas Research Sub-Committee of the larger Gas Investigation Committee.

Work has been continued under the supervision of Professor Cobb in two main branches for which Mr. J. W. Wood and Dr. A. Parker have been immediately responsible. All the work this year has been carried out at Leeds, partly in a laboratory provided by the Leeds Gas Department at the Meadow Lane Gas-Works, and partly on the new Corbet Woodall Experimental Gas Plant now attached to the Department of Coal Gas and Fuel Industries at the University.

The principal work to which Mr. Wood, assisted by Mr. G. B. Howarth, has given up his time has been a continuation and development of those studies in the aeration of burners by injection which have already formed the subject matter of the 9th and 11th Reports. It may be recalled that after a certain amount of general preliminary experimental investigation had been carried out, some typical heating burners of the types used in ring burners and gas fires were examined, their behaviour under deliberately varied conditions of operation being studied and summarized. Then came the turn of the lighting burners, upright and inverted, and the careful investigation made of these during the past twelve months forms the subject matter of the 13th Report (Part I.). The methods of testing had to be modified because of the comparative compactness and delicacy of construction of the lighting burner, and the necessity for making all measurements with the very minimum of interference with the delicately balanced streams of gas which had to be examined.

A number of interesting points emerged which can be found in the report. We have again adhered to the plan of placing in the forefront of each report a special introduction explanatory of what was projected and a summary of the principal results obtained.

An interesting deduction made from a large number of observations was that the degree of aeration by primary air obtained in an ordinary lighting burner, working normally and satisfactorily, was less than half that necessary for complete combustion. This indicates the high order of importance attaching to the construction of those parts of the burner and its accessories which influence the supply of secondary air, which must be made effective if good illumination is to result.

One of the factors of primary importance in aeration is the specific gravity of the gas which determines its injecting power, and it has been plain for some time that for the better information and equipment of the gas industry it was advisable to place the experimental determination of specific gravity on a better footing. Some careful work has been carried out in this connection, and it has been shown that, if properly installed and used, apparatus described by Blackie (Fuel Research Board Report, No. 5) can be operated with great accuracy and reasonable celerity. The necessary precautions and corrections are indicated (13th Report, Part II.).

Notes have been prepared too by Mr. Wood and Mr. Howarth embodying the experience of the Research Staff during the last seven years, on some important points in accurate gas analysis, and these have been put forward in an appendix.

Dr. Parker and his assistants have been occupied in getting the Corbet Woodall Experimental Gas Plant into a proper condition for the carrying out of reliable experimental work by its use, and in the making of preliminary tests. This has necessitated careful study of detail and some modification of the plant. A description of what has been done is published in the 14th Report to serve as a record in the Transactions of the Institution of Gas Engineers of the form taken by this important addition to the equipment of the University of Leeds.

The Committee would like to acknowledge its indebtedness again to Mr. J. W. Wood and Dr. A. Parker, the Research Chemists in charge of the two branches of its work now reported upon, for the continuing zeal, ability, and initiative which they have brought to bear upon the work committed to them, with the valuable aid rendered by Mr. Howarth as assistant to Mr. Wood, and by Mr. Kerr and Dr. Monkhouse as assistants to Dr. Parker. The opportunity is also taken of thanking Mr. C. S. Shapley and the Leeds Corporation Gas Department for the greatly appreciated facilities which they have continued to provide at the Meadow Lane Gas-Works.

SUMMARY.

PART I.

1.—This report (Part I.) is concerned with the degree of aeration of a number of typical low-pressure upright and inverted lighting burners, suitable for domestic use and for street lighting.

2.—The tests have been conducted under a variety of conditions at pressures up to 4 in. water-gauge (w.g.), mainly with gases of sp. gr. 0·49 and calorific value 460-470 B.Th.U. gross per c.ft., the nitrogen content being 10 to 11 p.ct. The average total theoretical air requirement per c.ft. of gas for complete combustion was 3·9 c.ft.

3.—The curves obtained, connecting air-gas ratio and gas pressure, were all of the same general type, showing a rapid increase in aeration with pressure up to 2·5 in. w.g., above which the further increase in aeration was relatively small.

4.—The amount of air injected as primary air, when the burners were adjusted as in normal practice, was usually slightly less than half the total air required for complete combustion.

In most cases, with a pressure of 2 in. w.g. or above, this limit was imposed by the necessity of obtaining *with the gas, mantle, and burner in use,* a stable flame of suitable size and shape for yielding reasonable illumination, and not by inability of the burner to inject a greater quantity of air.

5.—The quantity of air injected in the inverted burners tested, when adjusted for best illumination with

gas of the above quality was 1·7 to 2·1 c.ft. of air per c.ft. of gas, at a pressure of 2·5 in. w.g., although some of the burners were capable of injecting up to 2·5 c.ft. of air per c.ft. of gas when the air ports were fully open. The corresponding figures were higher for the upright burner.

6.—The air-port area provided when the shutter was fully open was in no case so small as to account for a low air-gas ratio; and the degree of aeration was not proportional, even in the roughest sense, to the air-port area, after a certain size, dependent upon the design of the burner, had been exceeded.

7.—In lighting burners (as with gas rings and gas fires—9th and 11th Reports) the heating-up of the appliance when in use materially reduced the quantity of air injected as compared with the performance on first lighting-up, when the burner, gas, and air were all at room temperature. This effect was much more pronounced with lighting burners than with gas rings and gas fires, amounting at times to as much as a 40 p.ct. reduction.

8.—With an upright incandescent burner the use of a chimney exerted no appreciable effect upon the primary aeration of the burner; the improvement in aeration obtained by the use of such a chimney being apparently due to more effective secondary aeration.

9.—The discharge-pressure relations for a number of typical commercial burner nipples have been determined. They exhibit considerable variations among themselves, and over the range ¼ to 4 in. w.g. deviate appreciably from the generally assumed relationship that the discharge is proportional to the square root of the pressure. For the same gas and nipple, however, and for a range of (say) 1 in. w.g. above and below a working pressure for which the discharge has been determined (say, 2·5 in. w.g.), the error resulting from the application of the usual formula would in general be less than 1 p.ct.

PART II.

10.—Much attention has been paid to the determination of the specific gravity of gases. The differential column method described in Technical Paper No. 5 of H.M. Fuel Research Board has been carefully examined. Full details are given of the instruments and the methods we have adopted, and our results show that the method is convenient, rapid, and capable of yielding results correct within ± 0·002 with ordinary town gas (sp. gr. about 0·5).

11.—A critical review is included of the methods of gas analysis adopted in the course of our investigations.

PART I.

AERATION OF LIGHTING BURNERS.

Introduction.

This report is the natural continuation of the 9th and 11th Reports of the Gas Investigation Committee, dealing with the factors which influence the amount of air injected by gas burners. It extends the investigation to cover lighting burners, both upright and inverted, of types suitable for domestic and for public lighting.

In selecting the burners to be tested, care was taken that they should be good specimens of their class, each burner representing as far as possible a commonly occurring type, with some characteristic feature either in construction or mode of operation. Careful inquiry seemed to indicate that, but for one well-known exception, the use of a fixed orifice in lighting burner nipples was declining; and most of the experimental work in the present report was conducted with variable nipples of the needle-regulated type, shown in cross-section in fig. 6. As to the relative injecting efficiencies of single fixed orifices, multiple fixed orifices, and variable nipples, we are not yet in a position to speak; but of the adaptability of the latter for use with different grades of gas, and supplies at a variety of pressures, there can be no question. The results of an examination of a number of these nipples, in an attempt to obtain some discharge characteristics, are given later in the report.

So far as reporting the results of tests is concerned, these variable nipples present a serious problem, for there is great difficulty in conveying to a reader an idea of the precise adjustment of a commercial nipple, and even the experimenter himself may have difficulty in defining or reproducing a particular adjustment, while calculations of velocities of flow, &c., of the gas stream from the nipple become almost impossible.

Unless otherwise stated, the nipples have been adjusted as follows. Upon the basis of the results given in the 1st, 2nd, and 3rd Reports of the Gas Investigation Committee, there was selected for each burner a certain thermal rate which might be expected to yield a reasonable illuminating power and thermal efficiency. Knowing the calorific value of the gas, it was a simple matter to deduce the corresponding gas rate; and it was further agreed that the nipple should be adjusted to deliver this quantity with a pressure of 2·5 in. w.g. immediately behind the regulating needle. A margin of ± 5 p.ct. was allowed on this initial adjustment, because slight changes in gas quality, specific gravity, temperature, and barometric pressure would have rendered adjustment to a precise rate most difficult, and it is doubtful whether any particular advantage would have been obtained thereby. The nipple thus adjusted was then used for a series of aeration tests at different pressures without being further disturbed—*i.e.*, for the time being it became a "fixed orifice" of a particular design. This group of tests indicated to what extent further adjustment might be necessary to secure satisfactory behaviour of the burner.

In nearly every case the degree of aeration was determined in the first place with the gas unlighted. This enables one at the outset to pick out burners presenting a high resistance to the flow of gas and air, and provides a basis for estimating the relative importance of thermal and injector effects in determining the final aeration of the burner.

The tests have all been conducted with gases of a specific gravity not far removed from 0·5, and as a matter of convenience a works supply was used having a specific gravity ranging from 0·477 to 0·500. The gas for any particular series of tests was stored in a 200 c.ft. experimental holder, and drawn upon as required. The complete series of tests with any one burner usually extended over several days, and it was found impossible to keep the specific gravity of the gas constant for the whole series, even when working upon gas from one filling of the holder. There was a progressive lowering of the specific gravity of the gas when standing in the holder, which was indicated quite plainly by the differential column apparatus, and was consistent with the removal of CO_2 from the gas as shown by analysis of the portions used in tests on successive days. For gas of sp. gr. 0·5 a removal of 1 p.ct. of CO_2 would reduce the sp. gr. by 0·010—*i.e.*, by 2 p.ct.

The analyses given in Table 1 indicate the general character of the gases used, and where the specific gravity calculated from the analysis differs from that quoted in connection with any particular series of tests, the difference may be ascribed to the changes taking place in the holder between the times of making the aeration tests and gas analyses respectively. It was in this connection that the development of a rapid and reasonably accurate method of determining specific gravity was of the greatest service (see Part II).

The gases were all produced by steaming in vertical retorts, a certain amount of water gas also being added, and it will be noted that the nitrogen content is low, 10 to 11 p.ct. The average amount of air theoretically necessary for the complete combustion of 1 c.ft. of the gases used was 3·89 c.ft. and there was very little variation in the different samples. Due allowance was made for the small amount of oxygen already present in calculating this air requirement, which is the amount actually to be supplied either as primary or secondary air.

The air-gas ratios were determined in the manner already described for other burners—*i.e.*, samples were drawn from the burner at a point where mixing of gas and air might be assumed to be reasonably complete, and the CO_2 produced per c.ft. of the mixture when burned

TABLE 1.—*Particulars of Gases used for Aeration Tests with Lighting Burners.*

Gas.	F.	G.	H.	I.	J.	K.	M.	Average.
Analysis:								
CO_2	3·6	3 5	4·0	3·9	3·4	3·5	4·1	3·7
C_mH_n	1·9	2·0	2·2	2·1	1·8	2·1	2·4	2·1
O_2	0·6	0·7	0·9	0·6	0·8	0·6	0·6	0·7
CO	15·0	13·8	13 8	14·2	14·3	15·7	16·3	14·7
H_2	46·6	46·5	46·4	47·1	47·6	47·6	46·2	46·9
CH_4	21·1	22 6	22·2	21·9	21·9	21·0	20·7	21·6
N_2	11·2	10·9	10·5	10 2	10·2	9·5	9·7	10·3
	100·0	100·0	100 0	100·0	100·0	100·0	100·0	100·0
Sp. gr. of dry gas from analysis. Dry air = 1·00	·490	·487	·491	485	·477	·482	·500	·487
Ca'c. calorific value, B.Th.U. gross, per c.ft.	457	470	471	468	463	466	469	466
C.ft. air required per c ft. of gas for complete combustion	3·81	3·94	3·93	3·92	3·87	3·89	3·89	3·89

over copper oxide was determined. This was compared with the CO_2 produced upon combustion in the same way of the gas in use. A small correction for CO_2 present in the air of the room was applied. All analyses were made in duplicate.

Lighting burners are comparatively small appliances and extremely sensitive to changes in the degree of aeration. Special care was therefore necessary to see that the sampling device and method of sampling, while securing a representative sample of the mixture, interfered as little as possible with the normal action of the burner. This necessitated a very small sampling tube, and the samples were drawn into a mercury sampler of 120 c.c. capacity through a steel tube of only 1 mm. external diameter ($\frac{1}{2}$ mm. bore), and from 4 to 6 min. were required for collecting a sample. Provision was made for maintaining a slow stream of the mixture to be sampled through a branch arm by a regulated "pull" from a water pump; but even had this not been done, the dead-space in the connecting tube (only 15 in. long) would have had little effect upon the aeration value. The steel tube was silver-soldered into a small brass bush which could be screwed into an appropriate place in each burner. The sampling points are indicated by arrows in figs. 1 to 9. In all cases the lighted burner was allowed to run for at least an hour before commencing aeration tests, and for about half-an-hour after any readjustment of gas rate, so that fair equilibrium should be attained in the thermal condition of the burner.

The tests with the various burners are not reported in the order in which they were made, and it will be noted that in a number of cases subsidiary experiments have been conducted to elucidate points of interest. As in previous reports, observed gas rates are given which have not been reduced to the usual standard temperature and pressure. In the case of unlighted burners, the gas and air would be at the same temperatures within 1° or 2° Fahr., and volumetric air-gas ratios would be unaltered on reduction to standard conditions. In the case of lighted burners it will be seen that the gas rate for a given pressure is often appreciably affected by heating-up of the nipple by conduction or radiation. There is great uncertainty as to the temperature of the air injected when it reaches the air ports with the lighted burners. Ordinary thermometers cannot be used for determination of its temperature, because any attempt to screen them from the effects of radiation would inevitably prevent the free access of air to the air ports of the burner. In the later types of inverted burners the incoming air is considerably heated. From the method of determination, the air-gas ratios calculated are the equivalent ratios on the basis of gas and air at the same temperature, whatever the actual temperature of either may have been during the test.

The tests were conducted at pressures within a few hundredths of an inch, $\frac{1}{2}$ in., 1 in., 2 in., and 4 in. w.g. for each series. On figs. 1, 4, and 7 two pipes are shown. The one nearer the burner is that to which the pressure gauge is attached, the pressure being determined with the burner in operation. The other is for the gas supply. The aeration results were carefully plotted for each pressure, and the values given in the tables were read off from the original curves to correspond exactly with the pressure quoted. Facilities were not available for combining accurate photometric determinations with the aeration measurements. In most cases where changes in illuminating power are reported, they were of such a character as to be unmistakable, while in others use was made of approximate determinations with the Lumeter.

UPRIGHT INCANDESCENT BURNER (No. 1).

The upright burner chosen for test was a recent pattern by a well-known maker (fig. 1). It was extremely simple in construction, and the body could hardly be made shorter than in this model (overall length of burner and nipple $3\frac{7}{8}$ in.). The principal resistance in the burner was undoubtedly the head of pierced refractory material, in which the total area for passage of gas was about two-thirds that of the minimum cross-section of the mixing tube. The burner was very similar to the simple burner designated "No. 1" in the 1st and 2nd Reports of the Gas Investigation Committee, or that described as "No. 3" in the Uddingston tests of the 2nd Report. It differed from both, however, in so far that a variable needle-regulated nipple replaced the fixed nipples of the earlier burners. The air ports consisted of slots in two concentric movable cylinders. The maximum air-port area with 8 slots fully open was ·50 sq. in., which was 3·4 times the throat area of the mixing tube. The sampling tube in this burner was screwed into the side-wall of the expansion immediately below the burner head, where it could not obstruct the free travel of the air-gas mixture.

TABLE 2.—*Upright Incandescent Burner (No. 1).*

Gas Used.—Gas J, Table 1.

Calorific Value.—463 B.Th.U. gross per c.ft.

Total Air Requirement.—3·87 c.ft. per c.ft. of gas.

Nipple.—Variable nipple, No. 10.

I.—Burner fitted with mantle and chimney; *gas unlighted;* air ports fully open. Average meter temperature during tests, 62·5° Fahr. Barometer, 30·3 in. Sp. gr. of dry gas, 0·484 (dry air = 1·00). See fig. 12, curve A.

Gas Pressure. Inches Water Gauge.	Uncorrected Gas Rate. C.Ft. per Hour.	Air-Gas Ratio.	Air-Gas Ratio as Percentage of	
			Value at 4 in. Pressure.	Total Air Requirement.
0 50	2·30	3·47	79	90
1·00	3·23	3 87	88	100
2 00	4·45	4·14	94	107
2·50	4·91	4·23	96	109
3·00	5·40	4·30	98	111
4·00	6 25	4·41	100	114

II.—Burner fitted with mantle and chimney; *gas lighted;* air ports fully open. Average meter temperature during tests, 62° Fahr. Barometer, 30·0 in. Sp. gr. of dry gas, 0·478. See fig. 12, curve B.

0 50	2·30	2·04	80	53 (1)
1 00	3·22	2·24	87	58 (2)
2·00	4·47	2 45	96	63 (3)
2·50	4·92	2 50	98	64
3·00	5 34	2 54	99	65
4 00	6 15	2·56	100	66 (4)

III.—Burner fitted with mantle, *chimney removed; gas lighted;* air ports fully open. Average meter temperature during tests, 63·5° Fahr. Barometer, 30·0 in. Sp. gr. of dry gas, 0·478. See fig. 12, points marked "x."

1·00	3·14	2·16	84	56
4 00	6·11	2·58	100	67 (5)

(1) Only $\frac{1}{2}$ in. of mantle giving useful illumination.
(2) About $\frac{3}{4}$ in. " " " " "
(3) About half the mantle passably well heated. Much better general effect by closing all but one air slot.
(4) Mantle fully heated and burner slightly noisy. Slightly better result with only two air holes open.
(5) As with chimney, but partial closing of air holes renders results slightly inferior.

Minimum cross-section of mixing tube = 0·150 sq. in.

Fig. 1.—For aeration curves see Fig. 12.

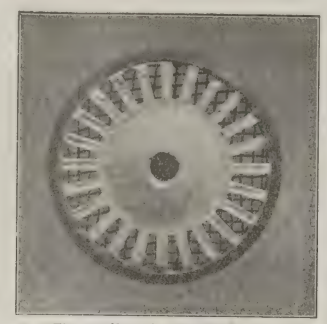


Fig. 2.—Head for upright burner.

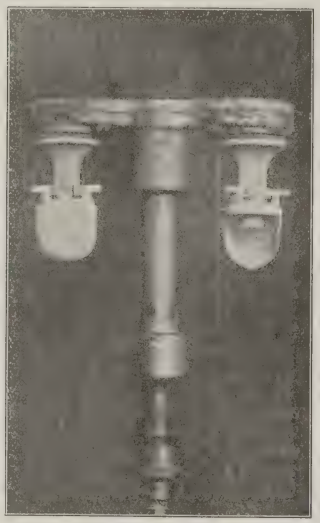


Fig. 3.—For aeration curves see Fig. 13.

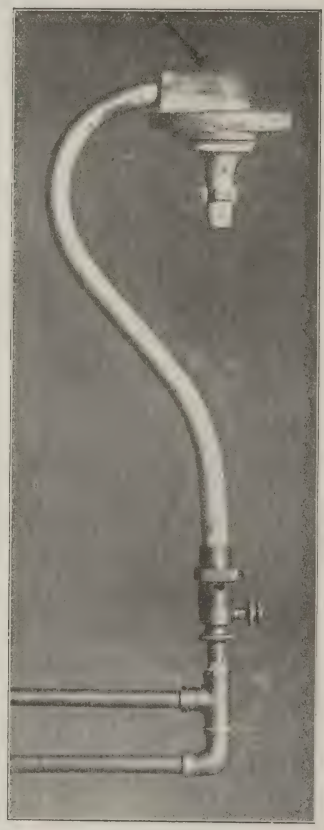


Fig. 4.—For aeration curve see Fig. 15.

The aeration curves for this burner were of a type which has become quite familiar, showing a rapid increase in aeration with pressure up to about 2 in. w.g., after which the further increase in aeration with pressure was relatively small (fig. 12). The degree of aeration reached with the unlighted burner was the highest attained in the experiments recorded in this report—viz., 4·41 c.ft. of air per c.ft. of gas, thus exceeding the amount of air theoretically necessary for complete combustion of the gas by 14 p.ct. Had the gas been one of 500 or 525 B.Th.U. gross per c.ft., however, and of the same specific gravity, exactly the same air-gas ratio would have been attained, but this same amount would then have represented a quantity somewhat short of that theoretically necessary for complete combustion. The aeration curve obtained for the lighted burner when fitted with the usual cylindrical glass chimney (6 in. high) was practically of the same shape throughout as for the unlighted burner, but the aeration had fallen to only 58 p.ct. of its former value; the highest air-gas ratio recorded being 2·56 c.ft. of air per c.ft. of gas at 4 in. w.g. pressure. Under these conditions, when burning gas of the quality indicated, at a rate of slightly over 6 c.ft. per hour, the mantle (usual "C" size) was fairly uniformly heated throughout, and the burner was just on the point of making the purring noise usually associated with full or over-aeration. While this degree of aeration may rightly be regarded as "over-aeration" for the purposes of combustion of this particular grade of gas in such a burner, it represents only two-thirds of the amount of air necessary for the combustion of the gas, and the remainder must be supplied as secondary air. As a matter of fact, the noise was eliminated and the illuminating power of the burner was appreciably increased by closing all but two of the eight air slots at this pressure, thereby reducing the primary aeration. (N.B.—This is by no means a reduction of the primary air to 25 p.ct. of its former value. See later). It would seem from observation of this burner that gas of the quality in question, when supplied with some 60 p.ct. of its theoretical air requirement as primary air, burns with a flame which is rather too conical to yield the best results with the usual type of cylindro-conical upright mantle, and it is necessary, especially at the lower gas rates, to enlarge the flame

Fig. 5.—Front view showing both mantles.

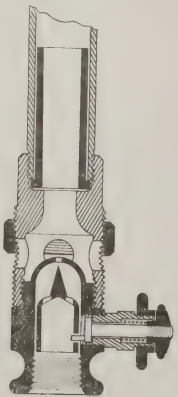


Fig. 6.—Detail of nipple, about full size.

by cutting down the primary air. A larger area of the mantle will then be heated, but the vigour of the combustion will be reduced. It is not possible to say, without resort to experiment, what part must be played by intensity, and what by illuminated area of mantle to secure the most efficient result in any particular case. It is certain, however, that regulation of the primary air gives us a means of controlling flame size and shape in the case of the upright mantle burner, and that so long as it is desired to obtain the maximum efficiency from the existing type of mantle and burner, this must be done by restricting the primary air to a quantity considerably short of that theoretically necessary for complete combustion of the gas. In these experiments, the highest degree of aeration, although considerably short of theoretically complete aeration, has definitely not yielded the highest efficiency and illuminating power. The third group of experiments in Table 2 was made with the chimney removed. (Points marked "x," fig. 12). In the 2nd Report of the Gas Investigation Committee, pages 291-293, it was pointed out that many upright burners were used in this state, and that the illuminating power was in consequence frequently lower than it might otherwise be. The beneficial effect of the chimney must be due almost entirely to the control which it exercises upon the secondary air supply and to conservation of heat in the neighbourhood of the mantle, for the above experiments indicated a practically negligible difference in the primary aeration figures whether the chimney was present or absent. The greatest difference was at 1 in. pressure, and this was due in part to the reduced gas rate consequent upon heating-up of the gas nipple because of a reduction in the cooling stream of air which the chimney develops around the burner body.

STREET LIGHTING BURNER (No. 2).

The burner chosen for test was one in extensive use for street lighting by the Manchester Corporation Gas Department, and was kindly supplied by the Superintendent of Street Lighting (fig. 3). It was provided with a single fixed orifice for gas delivery, the gas nipple being mounted above a small floating-plate governor which cut down the pressure at the nipple to about 2½ in. w.g. As it was desirable, for the purposes of our experiments, to test up to 4 in. pressure, the governor was removed. The stem of the burner was a plain parallel tube 5¼ in. long by ½ in. bore, provided with two five-sixteenth in. diameter holes for air intakes. The maximum air-port area was thus 0·78 times the cross-section of the mixing tube. The burner was fitted with a cast-iron superheater head carrying two Sugg fireclay nozzles for No. 2 (medium) mantles. In carrying out some of the tests with the unlighted burner, a sheet of tin 12 in. in diameter was mounted on the stem of the burner three-quarters of an inch above the air intakes, to prevent contamination of the air supply with gas discharged from the nozzles. With the lighted burner this precaution was unnecessary, as the draught generated by the burner carried the products of combustion away from the air ports.

The aeration-pressure curve for the unlighted burner was very similar to that for the upright burner, although the air-gas ratios are all much smaller (about three-quarters of the value for the upright burner), and the change in direction of the curve below 1 in. pressure was rather more pronounced.

TABLE 3.—*Inverted Street Lighting Burner (No. 2).*

Gas Used.—Gas F, Table 1.
Calorific Value.—457 B.Th.U. gross per c.ft.
Total Air Requirement.—3·81 c.ft. per c.ft. of gas.
Nipple.—Fixed orifice No. 14. Governor removed.

I.—Burner without mantles; *gas unlighted;* air ports fully open. Average meter temperature during tests, 62° Fahr. Barometer, 29·9 in. Sp. gr. of dry gas, 0·494 (dry air = 1·00). See fig. 13, curve A.

Gas Pressure. Inches Water Gauge.	Uncorrected Gas Rate. C.Ft. per Hour.	Air-Gas Ratio.	Air-Gas Ratio as Percentage of	
			Value at 4 in. Pressure.	Total Air Requirement.
0·25	1 60	2 16	67	57
0·50	2·31	2·76	86	72
1 00	3·37	2·90	90	76
2·00	4·82	3·06	95	80
2·50	5·39	3 11	97	81
3 00	5 93	3·14	98	82
4·00	6 84	3·22	100	84

II.—Burner fitted with 2 medium mantles; *gas lighted;* air ports fully open. Average meter temperature during tests, 62° Fahr. Barometer, 30·2 in. Sp. gr. of dry gas, 0·490. See fig. 13, curve B.

0 50	2·19	1·48	61	39
1·00	3·16	1 60	88	42
2 00	4·57	1 68	92	44
2·50	5·17	1·74	96	46
3·00	5 68	1·78	98	47
4·00	6·57	1·82	100	48

Some additional tests were made to ascertain, if possible, the cause of these small air-gas ratios. Tests were made at 4 in. pressure (gas unlighted) with and without the mantles on the nozzles. The air-gas ratios did not differ by more than 1 p.ct. from one another or from those already obtained. The closely fitting mantles therefore were not the cause.

There was in the upper part of each nozzle a wire-gauze grid, about ⅝ in. dia. The area occupied by wires (20 per lineal inch, 28 S.W.G.) was approximately equal to that of the spaces between them—i.e., 0·152 sq. in. —which was nevertheless still twice that of the final outlet area at the tip of each nozzle—viz., 0·0767 sq. in. Comparative tests were made at 4 in. pressure with and without these gauzes in position. The air-gas ratio without the gauze was definitely the higher, but only to the extent of 2 to 3 p.ct. This, it should be pointed out, was for a new gauze. In practice these mixing and dis-

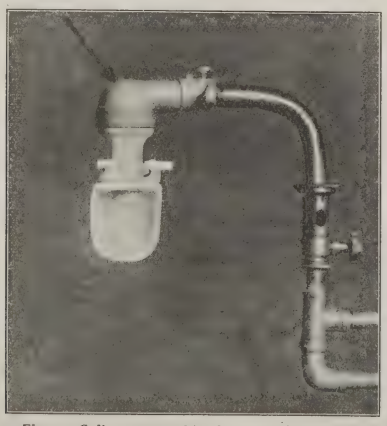


Fig. 7.—Gallery removed to show superheater and nozzle.

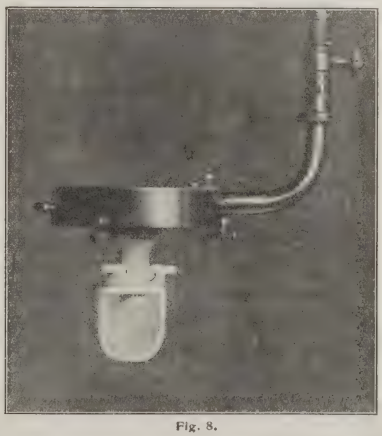


Fig. 8.

For aeration curves see Fig. 16.

tributing gauzes act as filters, and, particularly in domestic use, become corroded and covered with partially carbonized dust of a fluffy character, which may seriously restrict the area for the flow of the air-gas mixture, and consequently reduce the degree of aeration.

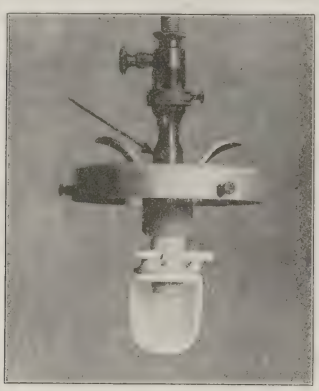


Fig. 9.—For aeration curves see Fig. 117.

The question naturally arose as to whether the air ports were of adequate size or not. The most convincing answer would have been given by repeating the tests with enlarged air ports. This was not practicable; but comparative tests were made at 1 in. and 4 in. pressure with the air ports fully open, and again, when only half open. The results indicated a reduction of the air-gas ratio to 83·5 p.ct. of the fully open value at 4 in. pressure, and to 79 p.ct. at 1 in. pressure. The mean reduction in aeration on half-closing the air ports of this burner was thus only about 20 p.ct., and it is reasonable to assume, therefore, that any practicable enlargement of the openings beyond their present "fully open" dimensions would have relatively little effect upon the air-gas ratio. In passing, it is of interest to note that the reduction in aeration was not a strictly constant proportion over the range of gas pressures used, and that a reduction of the air-port area to one-half affected the degree of aeration in a more marked manner than halving the effective area at the base of the nozzles by the insertion of wire gauze.

Fig. 10.

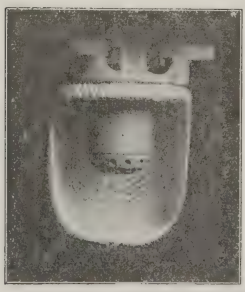


Fig. 11.

Enlarged views of alternative nozzles for above burner.

The tests with the lighted burner yielded an aeration curve of the same general type, with, however, a much lower degree of aeration. It approximated to 56 p.ct. of the corresponding values for the unlighted burner, and at its very best (4 in. pressure) was only 1·82 c.ft. of air per c.ft. of gas, or 48 p.ct. of the theoretical air requirement for this grade of gas. At 1 in. pressure, about one-third of the mantle was heated, while at 2 in. seven-eighths of the mantle was heated, and illumination might be considered just satisfactory. From 2 in. upwards, Lumeter measurements showed the illuminating power to be increasing approximately in proportion to the increased gas delivery. At the highest pressure the mantle was fully illuminated; there was no evidence of wastage of gas above the mantle; and the burner was just short of making a noise. Even if the burner had been capable of injecting a greater quantity of air, it is highly probable that the air shutter would have been closed to reduce the degree of aeration to about the above value, which seemed to represent almost ideal working conditions for the burner, mantle, and gas in use. (See also burner No. 3). It is clear, therefore, that the satisfactory operation of the burner was very dependent upon a secondary air supply. The reduction in the gas rate at a given pressure with the lighted burner was due to heating-up of the gas nipple by conduction and radiation. The superheater head was estimated to have a temperature not far removed from 200° C. at the highest gas rate.

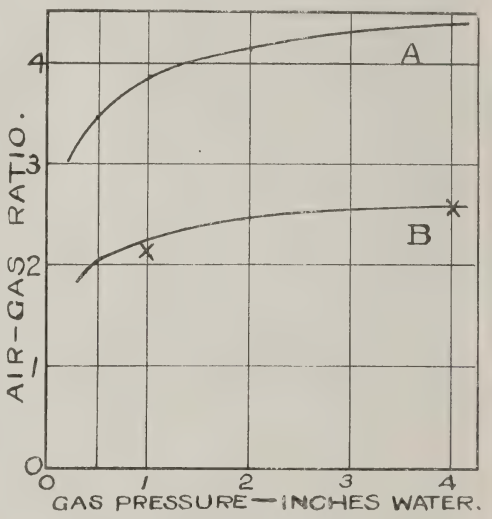


Fig. 12.—Burner of Fig. 1.

At 2½ in. pressure, the mantles being removed, the flames from the nozzles shot downwards to a length of 2½ in., with well-marked inner cones half-an-inch long. The observed air-gas ratio was 1·96, and is marked "x" on fig. 13. The increase in aeration above the corresponding pressure-point on curve B must not be ascribed to the removal of the resistance presented by the mesh of the mantle (see above), but rather to a reduction in the superheater and nozzle temperatures, the heat generated being less favourably placed for raising their temperatures than when generated in the confined space bounded by the mantles. It is noteworthy that at no time was any flame visible below the mantles, although removal of them would show long flames from the nozzles, and puncturing the mantles with holes of any size (say ⅛ in. dia. and upwards) always allowed flames to come through. Surface combustion on the mantle fabric with the aid of secondary air is probably, therefore, an important factor in determining the illuminating

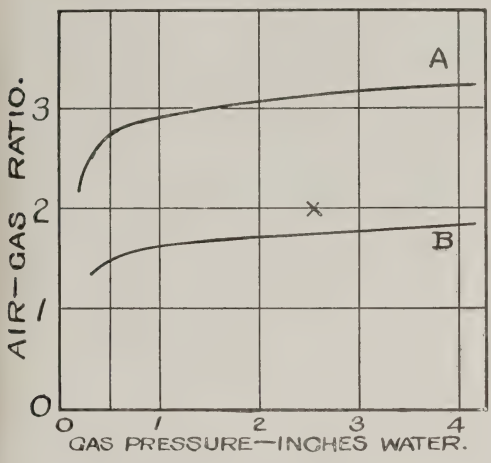


Fig. 13.—Burner of Fig. 3.

power. In this connection a careful exploration was conducted of the region around one of the mantles when the burner was operating at 4 in. pressure. Samples were drawn from the points indicated on fig. 14, and were at once analyzed for CO_2 in the large Haldane air-analysis apparatus. The dotted line, approximately $\frac{1}{4}$ in. away from the mantle, runs through points representing CO_2—concentration of 0·5 p.ct. As the undiluted products of combustion would contain about 12 p.ct. of CO_2, there must be an ample excess of air along the line thus mapped out. The method of sampling would not permit of closer approach to the surface of the mantle than $\frac{1}{4}$ in.; but it is plain that secondary aeration can play an important part in the operation of lighting burners, and that a considerable proportion of the necessary air can be effectively applied in this manner.

Street Lighting Burner (No. 3).

Burner No. 3 was a street lighting burner of a different type, but also fitted with a superheater head (figs. 4 and 5). It differed from the Manchester burner

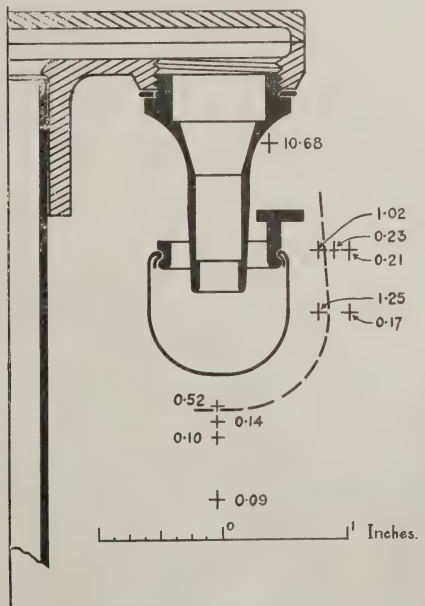


Fig. 14.—Distribution of CO_2 outside mantle. Figures indicate percentage of CO_2. (Burner of Fig. 3).

in being fitted with a variable nipple, and the long swan-neck bend of small bore ($\frac{3}{8}$ in.) connecting the nipple with the burner head might be expected to offer a considerable resistance. Immediately above the gas nipple the tube was still further contracted by a small funnel-shaped throat tube $1\frac{1}{4}$ in. long and only 9/32 in. dia. as shown in fig. 6. The two mantle nozzles were transferred from the Manchester burner to this one, so that the final outlet resistances should be identical for both burners.

The aeration curve for the unlighted burner was of the usual type, though not identical in shape with that of the previous burner. It will be observed that the gases used with burners Nos. 2 and 3 had about the same specific gravity, and that the gas rates at equal pressures were closely similar. The degree of aeration with burner No. 3 unlighted, however, was only about 90 p.ct. of that with burner No. 2.

The results obtained with the lighted burner (II.) presented a feature of interest, in so far that a maximum degree of aeration was attained between 2 and 3 in. pressure. This was not an unreasonable result, for with this burner unlighted, and with the other burners also, the air-gas ratio was increasing only slowly with pressure above $2\frac{1}{2}$ in. w.g. At the same time it was known that the heating-up of the burner caused a marked diminution in the air-gas ratio—with quantities so delicately balanced it was quite possible for the adverse thermal effect to exceed the injector effect and yield a reduced air-gas ratio upon increasing the pressure, and consequently the thermal delivery. An attempt was made to reproduce this phenomenon; but it was not exhibited by curve C, fig. 15, which conforms with the others.

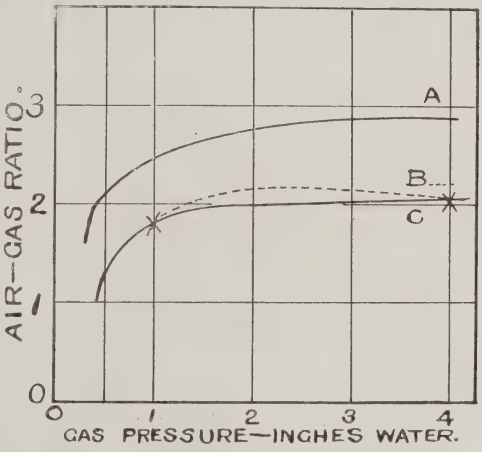


Fig. 15.—Burner of Fig. 4.

It was found that upon lighting-up from the cold this burner always went through the same cycle of changes. At first the burner was silent, and the velocity of the more highly aerated mixture of the cold burner was sufficient to maintain a stable flame. After some three minutes the nozzles and superheater warmed up, the air-gas ratio fell, the rate of flame propagation increased, probably to a greater extent than the rate of mixture flow (due to thermal expansion in the superheater and nozzles), and the burner became noisy and unstable.

Shortly after this, the illumination of the mantles would fall-off appreciably. The illumination could be restored by temporarily closing the air ports, afterwards opening them fully again, when good illumination would be obtained almost indefinitely unless some trifling hiatus in the action of the injector caused a resumption of the inferior illumination conditions, which then became permanent. Eventually it was discovered that when the illumination fell-off in this way the burner was operating in a partially " struck back " condition, the gas burning just inside the nozzle (or possibly as far back as the gauze), which became extremely hot. The effect of a

TABLE 4.—*Inverted Street Lighting Burner (No. 3).*

Gas Used.—Gas G of Table 1 for I. and II.; Gas I for III.; Gas J for IV.
Calorific Values.—470, 468, and 463 B.Th.U gross per c.ft. respectively.
Total Air Requirement.—3·94, 3·92, and 3·87 c.ft. per c.ft. of gas.
Nipple.—Variable nipple, No. 13.

I.—Burner with two mantles, *gas unlighted;* air ports fully open. Average meter temperature during tests, 61° Fahr. Barometer, 29·0 in. Sp. gr. of dry gas, 0·497 (dry air = 1·00). See fig. 15, curve A.

Gas Pressure. Inches Water Gauge.	Uncorrected Gas Rate. C.Ft. per Hour.	Air-Gas Ratio.	Air-Gas Ratio as Percentage of	
			Value at 4 in. Pressure.	Total Air Requirement.
0·50	2·35	2·11	73	54
1·00	3·42	2·47	86	63
2·00	4·83	2·76	96	70
2·50	5·37	2·82	98	71
3·00	5·89	2·85	99	72
4·00	6·75	2·88	100	73

II.—*Gas lighted,* air ports fully open. Average meter temperature during test, 62·5° Fahr. Barometer, 28·9 in. Sp. gr. of dry gas = 0·492. See fig. 15, curve B, dotted.

0·50	2·28	1·30	64	33
1·00	3·27	1·80	89	46
2·00	4·66	2·12	105	54
2·50	5·19	2·14	106	54
3·00	5·68	2·14	106	54
4·00	6·51	2·03	100	52

III.—*Gas lighted,* air ports fully open. Average temperature during test, 61·5° Fahr. Barometer, 28·9 in. Sp. gr. of dry gas, 0·484. See fig. 15, curve C.

0·50	2·28	1·30	63	33
1·00	3·28	1·77	87	45
2·00	4·69	1·99	97	51
2·50	5·21	2·01	97	51
3·00	5·70	2·02	98	52
4·00	6·53	2·06	100	53

IV.—*Gas lighted,* air ports varied. Average temperature during tests, 65° Fahr. Barometer, 30·3 in. Sp. gr. of gas, 0·487. Gas pressure, 2·5 in. w.g. Gas rate, 5·07 c.ft. per hour (uncorrected).

Number of Turns of Regulating Ring.	Area of Opening Exposed. Sq. In.	Area as Percentage of Maximum Opening.	Air-Gas Ratio.	Air-Gas Ratio as Percentage of Maximum.
0	0·150	100	2·07	100
3	0·075	50	2·02	98
4	0·048	32	1·97	95
6	0·000	0	*Nil*	0

Cross-section of mixing tube at throat ($\frac{3}{8}$ in. dia.) = 0·0621 sq. in.
Air port area, 4 holes $\frac{7}{32}$ in. dia. = 0·150 sq. in. total.
Overall length of burner and nipple, 10·5 in.

temporary closing of the air ports was to supply a mixture with a lower rate of flame propagation, while still maintaining a considerable rate of mixture travel. This brought the flame outside the nozzle, which cooled somewhat, and stable conditions were obtained—very delicately balanced, it is true—with the flame outside the nozzle. The point is one of considerable practical importance in burner adjustment, particularly when critical adjustment for maximum efficiency is being attempted. Thus, it is possible to allow a burner to become hot, and then adjust it on the photometer bench to maximum efficiency, apparently in a perfectly stable condition. If now the burner is extinguished and allowed to cool, it may not be possible for it automatically to resume its former illuminating power when lighted, owing to the necessity for passing through an intermediate condition on warming-up, which would give rise to the partially "struck-back" condition referred to above. At 4 in. pressure we have been able to obtain two air-gas ratios with this burner, a higher one corresponding with the flame outside the nozzle and lying above curve B (fig. 15), only obtainable by adjustment of the hot burner, and the other represented by curve B, corresponding with a partially "struck-back" condition. On the whole, curve C lies slightly below curve B; but this is in part due to the lower specific gravity of the gas used for the tests of curve C.

Burners Nos. 2 and 3 were used at about the same gas rates with the same mantles and nozzles. From comparison of fig. 13, curve B, with fig. 15, curve C, at say 3 in. pressure, it would seem that the difference between 1·8 and 2·0 c.ft. of air per c.ft. of gas, for gas of the quality used, represents the margin between safe working and unstable working due to "over-aeration," although even the higher figure represents only one-half the air theoretically necessary for the complete combustion of the gas, injected as primary air. It will be noted that the reduction in air-gas ratio of the lighted as compared with the unlighted burner is rather smaller with this than with the Manchester burner. This is doubtless due to differences in the design of the superheater and the disposition of the mixing tube.

A brief examination was made as to the effects of air-port adjustment upon the behaviour of this burner. It is plain that the air shutter is only one of a number of resistances to be overcome in working the burner, and much will therefore depend upon whether, in its fully open position, it constitutes the main, or any considerable proportion of the whole resistance of the burner. The air ports of this burner consisted of four holes 7/32 in. dia., with a total area of 0·150 sq. in. They could be closed by a threaded cut-off ring taking six complete turns to close the air ports entirely. As the ring was obscuring circular openings, the reduction in air-port area per turn was not uniform. The results of tests with three air-port adjustments are indicated in Table 4 (iv). The first result for the fully open air ports shows an air-gas ratio in good agreement with curves B and C already obtained. The burner was slightly noisy. Upon reducing the air-port opening by half (i.e., 3 turns of ring) the illuminating power was increased, and the air-gas ratio fell, but only by a trifling amount—2 p.ct. This may be contrasted with the 20 p.ct. change brought about by half-closing the air shutter of the Manchester burner. A further turn of the ring reduced the air-port area to one-third of its original amount, but the air-gas ratio had only fallen by 5 p.ct. in all, and the illuminating power of the burner was excellent. It is clear that for 6 turns—i.e., complete shut-off—the air-gas ratio would be nil. Practically the whole of the effective regulation of aeration, therefore, fell upon the last two turns of the ring; and if the original maximum air-gas ratio was low, it could clearly not be ascribed to insufficient air-port area in this case.

Further, these figures and those obtained with other burners show very plainly that the degree of aeration is *not* proportional to the area of air-shutter opening provided. Other workers also have shown that the relation between air-port area and degree of aeration for given conditions of operation must be determined for individual burners, and that the degree of aeration is not proportional to air-port area. Nevertheless, the contrary erroneous view, that aeration is proportional to air-port area, is still sometimes encountered.

UNIVERSAL REVERSIBLE INVERTED BURNER (No. 4).

This series of tests was conducted with a domestic burner designed to take the popular "universal" inverted mantle. The burner used is illustrated in figs. 7 and 8. The nipple points upwards, injecting into a tube of 13/32 in. bore, bent at right-angles, delivering into an aluminium alloy casting, which in its turn carries the refractory nozzle for the support of the mantle. Such burners are intended for attachment to brackets, etc., which previously carried upright fittings. The burner could also be reversed as shown in fig. 8. Illuminating power tests had already been made at Uddingston with this type of burner (2nd Report, Gas Investigation Committee, pp. 280-284, burners 5, 6, and 7), but the main reasons for its selection for aeration tests were that on account of its position the injector would keep relatively cool during operation of the burner, and the air supply was drawn from a region not likely to be mixed with products of combustion. In these respects it is in strong contrast to the type of burner next to be tested (see burner No. 5), although the latter is possibly the more common. The nipple used with the upright burner No. 1 was attached to this burner, and was worked at practically the same gas rates and pressures. As 6 c.ft. per hour may seem a high gas consumption for a universal inverted mantle, even with due allowance for the C.V. of the gas used (466 B.Th.U. gross), it may at once be noted that at this consumption there was no visible wastage of gas above or about the mantle, and

the gas rate might with advantage have been still further increased.

TABLE 5.—*Reversible Inverted Burner (No. 4).*

Gas Used.—Gas K, Table 1.

Calorific Value.—465 B.Th.U. gross per c.ft.

Total Air Requirement.—3·98 c.ft. per c.ft. of gas.

Nipple.—Variable nipple No. 10, injecting upwards.

I.—*Gas unlighted;* air ports fully open. Average meter temperature during tests, 62° Fahr. Barometer, 29·6 in. Sp. gr. of dry gas = 0·480 (dry air = 1·00). See fig. 16, curve A.

Gas Pressure. Inches Water Gauge.	Uncorrected Gas Rate. C.Ft. per Hour.	Air-Gas Ratio.	Air-Gas Ratio as Percentage of	
			Value at 4 in. Pressure.	Total Air Requirement.
0·50	2·34	2·31	77	59
1·00	3·15	2·68	89	69
2·00	4·52	2·86	95	73
2·50	5·05	2·89	96	74
3·00	5·53	2·93	98	75
4·00	6·37	3 00	100	77

II.—*Gas lighted;* tests unmarked made with air ports fully open; those marked "*" made with air ports closed to 75 p.ct. of original area. Average meter temperature during tests, 60·5° Fahr. Barometer, 29·7 in. Sp. gr. of dry gas, 0·476. See fig. 16, curve B.

0·50	2·33	1·33	Not comparable with rest of column.	34
1·00	3·13	1·70		44
2·00	4·37	1·99		51
*2·00	4·37	1·90	95	49
*2·50	4·85	1·96	98	50
*3·00	5·30	1 98	99	51
*4·00	6·06	2·01	100	52

Exit of mantle nozzle ⅝-in. diameter—*i.e.*, 0·110 sq. in.
Diameter of globe gallery, 3⅜ in.

The aeration-pressure curve for the unlighted burner calls for little comment. It does, however, illustrate the difficulty of talking of the injecting power of a nipple or jet as a separate property. Comparing Tables 2 and 5, for example, we have the same nipple delivering gas under almost identical conditions as regards specific gravity and pressure, but into different burners. In the case of the upright burner, the air-gas ratio was 4·4 at 4 in. pressure, while for the inverted burner it was only 3·0, this proportion being retained approximately over the whole pressure range.

Owing to difficulties with back-firing, it was not possible to complete the comparative tests with the lighted burner and fully open air ports over the whole pressure range up to 4 in. w.g. The air ports consisted of two holes ⅜ in. dia. (total area, 0·220 sq. in.), and, for the pressures above 2 in. w.g., the available air port area was reduced to 0·165 sq. in.—*i.e.*, 75 p.ct. of its original value. From previous experience it was assumed that this would not reduce the aeration by more than 5 to 10 p.ct., but it permitted the gas to be burned effectively in the burner, and the aeration line with the ports

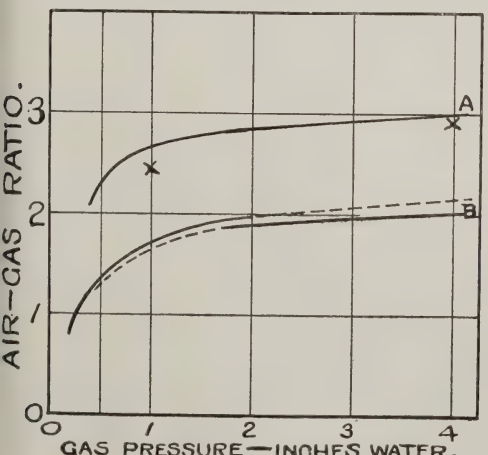


Fig. 16.—Burner of Fig. 7.

fully open (had the gas permitted it) would probably have been not far removed from the dotted line B on fig. 16.

In other respects the curves presented no unusual features. Once again, however, it was found necessary, in order to secure satisfactory combustion of the gas, to cut down the primary air supply below that which the burner was capable of injecting, and considerably (50 p.ct.) below that theoretically necessary for the complete combustion of the gas.

It was hoped to test this burner with the injector working in the inverted position as shown in fig. 8. From examination of the burner some little doubt existed as to whether the regulating pin would retain its exact location in the nipple when thus inverted, and the tests should preferably be carried out in the two positions with a burner injecting by means of a fixed orifice. For what they are worth, however, the results of two tests are indicated by "x" on fig. 16 for the unlighted burner injecting downwards. They are both clearly below curve A—a result which would be consistent with the extra load thrown upon the injector in working against the up-cast effect of the relatively light mixture which fills the tube between the mantle nozzle and the nipple. That the nipple becomes appreciably heated with this burner will be seen from examination of the relative gas rates at equal pressures for the lighted and unlighted burners.

INVERTED BURNER (No. 5).

This burner was of a type which probably represents by far the greater number of inverted gas burners in use to-day. The nipple was a variable one injecting downwards into a relatively short mixing tube, and a universal mantle was used.

The burner was a high-class article, and the injector was constructed of relatively few parts, all machined from the solid and carefully assembled. The general dimensions can be judged from fig. 9, the external diameter of the globe gallery being 3¾ in.

With this burner, alternative nozzles were used. The first was of the usual type with an outlet ⅝ in. diameter. It will be seen from fig. 10 that this nozzle projected only a short distance into the mantle. The second nozzle was of the more recent pepper-box type, perforated with 31 holes, each approximately 1/16 in. dia. The total outlet area was thus slightly less for the pepper-box nozzle than for the plain nozzle. It will be seen from comparison of figs. 10 and 11 that the pepper-box nozzle projected considerably further into the mantle than the plain.

The investigation of such a burner presented new difficulties, both in making the experiments and in interpreting the results. The injector, on account of its position, became very hot, as was shown by the difference in gas rate for equal pressures with the lighted and unlighted burner. Most manufacturers provide such burners with deflector plates, either of metal or of refractory material, immediately below the air-intakes. For practical and for æsthetic reasons such deflectors must be kept small; and it is doubtful whether they do more than protect the injector from flame with consequent firing of gas at the nipple, or from a very hot and concentrated stream of products of combustion. It is certain that a burner of this type draws its primary air supply from a region containing products of combustion. In considering injector efficiency, therefore, it may be necessary to credit the injector in the first place with all the mixture which it causes to circulate through the burner, irrespective of its composition. Of the quantity circulated, however, only part can be regarded as "fresh air" carrying with it the usual proportion of oxygen for combustion of the gas, and may be rightly regarded as the "air-gas ratio" of the burner for purposes of combustion.

These two quantities can be differentiated by determining, in the mixture samples, first the free CO_2 (partly derived from that already present in the unburned gas, and partly from admixed products of combustion) and secondly, the CO_2 produced on completing the combustion of the mixture over copper oxide. The calculations are indicated in Appendix II.

The first tests were made at 1 in. and 4 in. w.g. with the plain nozzle and the air shutter fully open, the gas

TABLE 6.—*Universal Inverted Burner (No. 5).*

Gas Used.—Gas M, Table 1.
Calorific Value.—469 B.Th.U. gross per c.ft.
Total Air Requirement.—3·89 c.ft. per c.ft. gas.
Nipple.—Variable nipple No. 15.

I.—Plain nozzle, no mantle, *gas unlighted*, air ports fully open. Average meter temperature during test, 60·6° Fahr. Barometer, 29·5 in. Sp. gr. of dry gas, 0·501 (dry air = 1·00). See fig. 17, points marked "x."

Gas Pressure. Inches Water Gauge.	Uncorrected Gas Rate. C.Ft. per Hour.	Air-Gas Ratio.	Air-Gas Ratio as Percentage of		Volume of Products of Combustion Injected per C.Ft. of Gas.
			Value at 4 in. Pressure.	Total Air Requirement.	
1·00	3·54	3·72	98	96	..
4·00	7·46	3 81	100	98	..

II.—As above, but with air shutter open only two turns of ring. Average meter temperature during test, 63·0° Fahr. See fig. 17, curve A.

0·50	2·49	1·80	75	46	..
1·00	3·65	2·26	94	58	..
2·00	5·24	2·35	98	60	..
2·50	5·90	2·37	99	61	..
3·00	6·48	2·38	99	61	..
4·00	7·56	2·40	100	62	..

III.—As II., but with universal mantle fitted and *gas lighted*. Average meter temperature during test, 64·6° Fahr. Barometer, 29·5 in. Sp. gr. of dry gas, 0 500. See fig. 17, curve B.

0·50	2·27	0·90	45	23	0·010
1·00	3·25	1·66	82	43	0·024
2·00	4·58	1·95	96	50	0·067
2·50	5·10	1·96	98	50	0·071
3·00	5·57	1·98	99	51	0·075
4·00	6·41	2 02	100	52	0·084
4·00 with Vitreosil globe)	6·41	2·05	..	53	0·047

IV.—Pepper-box nozzle, no mantle, *gas unlighted*, air ports fully open. Average meter temperature during tests, 62·9° Fahr. Barometer, 29·4 in. Sp. gr. of dry gas, 0·499.

1·00	3·61	3·68	96	95	..
4·00	7·51	3·83	100	98	..

V.—As IV., but with air shutter open only two turns of ring. Average meter temperature during test, 62·6° Fahr. Barometer, 29·4 in.

1·00	3·64	2·22	93	57	..
4·00	7·56	2 38	100	61	..

VI.—As IV., but with universal mantle fitted, *gas lighted*. Average meter temperature during test, 65·0° Fahr. Barometer, 29·4 in. See fig. 17, curve C.

1·00	3·17	1·79	72	45	0·045
2·00	4·49	2·27	92	58	0·057
2·50	5·06	2·32	94	60	..
3·00	5·56	2·39	97	61	..
4·00	6 41	2·47	100	63	0·057
4·00*	..	2·08	..	54	0·036

* Air ports open only two turns of regulating ring.

Throat area of mixing tube (½ in. dia.) = 0·049 sq. in.
Maximum air port area, 4 holes ¾ in. dia. = 0·196 sq. in.
Air port open two turns of regulating ring = 0·040 sq. in. = 82 p.ct. of throat area, or 20 p.ct. of maximum opening.
Outlet area plain nozzle = ⅜ in. dia. = 0·110 sq. in.
" " pepper-box nozzle (31 holes, 1/16 in. dia.) = 0·095 sq. in.
Distance from tip of nozzle to mantle-ring support: Plain nozzle, 1/16 in. Pepper-box nozzle, 1/16 in. (1/8 in.).

being unlighted. The results are indicated by "x" on fig. 17, and show a relatively high air-gas ratio, 3·7 to 3·8. The burner, however, would not operate with this degree of aeration, every attempt to light it being accompanied by a vigorous back-fire. The air shutter was therefore closed until the gas would burn with slightly noisy flames, which would ordinarily be described as "well aerated." The burner was allowed to cool down and the tests with the unlighted gas were repeated with the air openings thus restricted. The air-gas ratio was reduced to about 62 p.ct. of the value obtained with the fully open air shutter, although the air-port area was reduced to 20 p.ct. of its former value.

The burner was then tested with the gas lighted; the results being indicated by Table 6 (iii) or Curve B, fig. 17. The first point to observe is that, although the nipple was untouched between tests (ii) (gas unlighted) and tests (iii) (gas lighted), the heating-up of the burner in the latter tests was sufficient to reduce the gas rate by an amount ranging from 9 p.ct. at ½ in. pressure to 15 p.ct. at 4 in. pressure, the drop being progressive with increasing thermal development at the mantle. This type of burner, with the gas nipple immediately above the nozzle, exhibits the phenomenon to a more marked degree than any of the others. The temperature of the gas passing through the nipple might be roughly estimated from this drop in gas rate as about 100° C. Curves A and B, fig. 17, are of the same type, although the aeration falls away more rapidly and the shoulder on Curve B is less marked below 2 in. pressure, due to the modifying influence of thermal effects. The amount of air taken in as primary air with the burner in its normal working state was, as in previous examples, only about one-half the total theoretical air requirement of the gas. The air-gas ratios given are for air of normal composition. In the last column of Table 6 the amount of products of combustion taken in with the primary air has been calculated, and should be added to the air-gas ratio values to determine the total volume of mixture injected. From the analysis of the gas "M," Table 1, the products of combustion would have the following composition by volume, and the figures in Table 6, for the volume of products of combustion injected, assume the water formed during combustion to remain as steam.

CO_2. . . 10·4 p.ct.	H_2O (as steam) 20 6 p.ct.	N_2 . . 69 0 p.ct.

The amount of products of combustion drawn into a burner would be proportional to the quantity of air drawn in (*i.e.*, the air-gas ratio) and to the concentration of the products of combustion around the air-intakes of the burner. It will be observed that the amount of products of combustion injected in our tests ranged from 1 p.ct. of the gas volume at ½ in. w.g. to 8·4 p.ct. of the gas volume at 4 in. pressure, and this would have the same effects, so far as combustion is concerned, over the usual working range of the burner, as the addition of 7 to 8 p.ct. of inerts to the gas. As a matter of fact, it is possible to estimate the concentration of the products of combustion in the primary air supply, by dividing the volume of products taken in per c.ft. of gas by the sum of this quantity and the air-gas ratio. When considered in this way, and having regard to the proximity of the injector to the burning gas, the amount of admixture of products of combustion with the primary air supply is surprisingly small, amounting in these tests to only 2 to 3 p.ct. by volume of the air supply over the range 2 to 3 in. pressure. Actually, the figures show that the concentration of products of combustion in the primary air supply increases rather more rapidly than the rate at which gas is burned; but the quantities involved are so small that our determinations do not

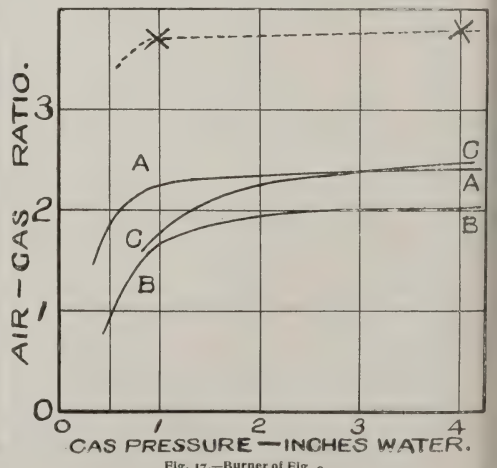


Fig. 17.—Burner of Fig. 9.

permit of more than a qualitative statement in this respect.

At 2 in. pressure when using the plain nozzle the burner was silent, and three-quarters of the mantle was heated. At 4 in. pressure the burner was slightly noisy and the mantle was fully heated, with a small amount of flame showing above the mantle ring. This could not be eliminated by increasing the primary air supply, any attempt to do so resulting in back-firing. A test was made at 4 in. pressure after fitting to the burner one of the usual open types of Vitreosil globes, the air and gas adjustments remaining unaltered. The burner became slightly more noisy and would back-fire more readily. The air-gas ratio was very little affected, but rather less products of combustion were taken-in with the primary air, probably because of the more effective air circulation around the burner when fitted with the globe.

The first tests with the air shutter fully open and the gas unlighted, using the pepper-box nozzle, gave air-gas ratios almost indistinguishable from those with the plain nozzle, so that the perforated end did not offer any appreciably greater resistance to the flow of gas and air than the plain nozzle. Slightly lower air-gas ratios were obtained with the pepper-box nozzle, when the air opening was throttled to correspond with the conditions of tests for the plain nozzle (gas unlighted). The difference, however, was very small, and there were slight changes in sp. gr. of gas, in atmospheric conditions, and in the re-setting of the air shutter, which would easily account for the observed changes in air-gas ratio.

The pepper-box nozzle would permit the air shutter to be opened fully, and back-firing did not occur, although the air-gas ratios obtained were some 20 p.ct. higher than could be used with the plain nozzle at corresponding gas rates and pressures. At 3 and 4 in., however, the burner was slightly noisy, and it was clear that with an air-gas ratio of about 2·4 : 1 the practical limit of primary aeration was approached for the burner and gas in use. Actually, there was very little change in illuminating power at 4 in. pressure when the air shutter was closed to correspond with the conditions of test for the plain nozzle; and the best illuminating power at the gas rate corresponding with 4 in. pressure would probably be obtained with a primary air-gas ratio lying somewhere between 2·08 and 2·47 for the pepper-box nozzle, when supplied with gas of the quality indicated. While the burner with the plain nozzle could not be started up from cold without back-firing to give a final air-gas ratio of 2·05 at 4 in. pressure with the hot burner, the pepper-box nozzle would permit of starting up from cold with the air shutter fully open, there being no tendency to back-fire at any stage as the burner approached its final working temperature.

Discharge of Gas Through Lighting Burner Nipples.

The work detailed in this section of the report was carried out as a preliminary to the aeration tests already described, and was intended, originally, to furnish some guide to the selection of nipples for those tests.

The discharge of gas through orifices of 0·25 in. dia. and upwards has been studied by many workers, and for ordinary gas-works pressures the relationship between discharge and pressure is fairly well established.

For the behaviour of very small orifices such as are used in multiple-orifice lighting-burner nipples, the work of Dr. J. S. G. Thomas may be consulted (Phil. Mag., Vol. XLVI, Nov., 1923), bearing in mind that the orifices used in his work were orifices in thin plates, and were prepared with extreme care.

The American Bureau of Standards has indicated some peculiarities in the behaviour of orifices of the sizes commonly used in domestic gas cookers, especially those due to differences in the shape of the nipple on the approach side of the orifice, and the thickness of wall through which the hole is made.

The single-orifice lighting-burner nipple is usually of a size intermediate between those studied by Dr. Thomas and by the Bureau, and it was considered desirable to establish the relation between discharge and pressure for such orifices, for town gas. It must be remembered that in commercial gas nipples the orifices rarely comply with the description of "holes in thin plates;" the thickness of wall usually being comparable with the diameter of the hole, and the shape of the nipple on the approach side of the orifice shows great differences, and is apparently a matter of taste with different manufacturers. Moreover, it was desirable to ascertain the characteristics of variable orifices fitted with regulating needles, such as were to be used in our aeration tests.

For this purpose a number of lighting-burner nipples were obtained of the type represented by Fig. 6. They were taken to pieces and subjected to examination with a hand lens, only those specimens which appeared satisfactory being retained. In most cases it was necessary to take off with an oilstone the burr left by drilling the orifice; to remove machine cuttings from the nipple; and to scrape off the burr left by drilling the holes in the regulating needle. Nothing was done to modify the size or shape of any parts, however, and these operations may be regarded merely as very careful finishing and assembly of the nipples. Careful cleaning, followed by examination and measurement of the orifice with a low-power microscope, preceded assembly.

In most of the nipples the clearance between the regulating needle and the body was large, bearing in mind the necessity for the accurate centring of the tip of the needle in a small orifice; and for fine regulation a more positive connection between the needle and the regulating spindle would seem desirable.

With each of fourteen selected nipples three series of tests were made at a number of selected gas pressures from 0 to 4·5 in. water gauge (w.g.).

(*i.*) With the regulating needle removed, so as to determine the behaviour of the simple orifice.
(*ii.*) With the needle in position, but drawn as far back as the mechanism of the nipple would allow, in order to obtain the maximum discharge.
(*iii.*) With the needle set so as to give a gas rate appropriate for the burner to which the nipple would be fitted.

The process of testing was simple, and it was mainly a question of careful observation of gas rates and corresponding pressures, and the application of a number of corrections in order to obtain gas rates of the requisite degree of precision for further calculation. Each nipple was mounted in turn above a fine-regulating quadrant-cock on the outlet of a $\frac{1}{10}$ c.ft. experimental meter; the gas pressure being measured immediately behind the nipple on a U-gauge filled with xylol. The gas was drawn from a 200 c.ft. holder, and its density was determined as indicated in Part II. of this report. By careful regulation of room temperature and the selection of suitable days for testing, it was possible to obtain atmospheric conditions not far removed from 60° Fahr. and 30 in. barometer, whereby large corrections to standard conditions could be avoided. A constant pressure of 5 in. w.g. was maintained at inlet meter, although the pressure at the nipple ranged from 1 to 4·5 in. It is not quite clear whether the volume and density of the gas should be considered with regard to the conditions prevailing on the pressure side of the orifice, or on the outlet side, although the difference in the two methods only exceeds the error of our experiments when the pressure exceeds 3 in. w.g. Actually all volumes and densities have been reduced to the prevailing atmospheric conditions (*i.e.*, zero w.g.) at outlet nipple.

The time required for a suitable number of whole revolutions of the meter was observed for each gas pressure, from which the gas rate was calculated. This was corrected for pressure at inlet meter (back to atmospheric), calibration error of meter, and variation in capacity of the meter per revolution, according to its rate of revolution (overdriving error), but *not* to 60° Fahr. and 30 in. bar., by means of the usual "tabular numbers." The barometric pressure and the temperature of the gas being known, it was possible to calculate the specific gravity of the moist gas under the prevailing conditions at the nipple, dry air at 60° Fahr. and 30 in. barometer being taken as standard (1·00).

The densities of the gases used in these tests rarely differed by more than 2 p.ct. from 0·475 (dry air = 1·00), and it was therefore a convenience to calculate, from the observed gas rate (corrected to the extent indicated above) and the density of the gas under the conditions at the nipple outlet, the corresponding discharge of gas of sp.gr.

0·475 (dry air at 60° Fahr. and 30 in. barometer = 1·00), assuming, for the purpose of calculating the correction, that the gas rate would be proportional to the square root of the density. The corrections to the observed gas rate to obtain the corresponding rates with gas of sp.gr. 0·475 were only small. Determinations were made at 1, 2, 3, and 4 in. water gauge (w.g.).

There was some difficulty in expressing concisely the results of the investigations. Graphical representation of the relationship between discharge and gas pressure was used; but there was room for considerable difference of opinion as to the position of the curve which best fitted the observations, and the method was abandoned as not sufficiently exact. Attempts were made to fit various curves to the observed points on the assumption that the discharge was proportional to the square root of the pressure, in turn making the curve fit at the highest pressure (4 to 4·5 in.), at 2·5 in. pressure (as being a typical working pressure), or at some other pressure which gave the best agreement between the square root curve and the observed points. It was evident that in the majority of cases it was not possible to fit any square-root curve to the observations without involving an error of more than 1 or 2 p.ct. of the gas rate, over some part or other of the pressure range 0·4·5 in. w.g. Numerous attempts to express the difference between observed and calculated discharges as a simple correction term to be applied to the square-root curve did not lead to any generally useful formula applicable to the whole of the nipples examined.

It was believed that the observations might be represented more accurately by an exponential formula of the type $q = Ap^B$, where q is the gas rate and p the pressure, A and B being constants, and the value of B not far removed from 0·5 (when $q = A\sqrt{p}$, or $Ap^{0.5}$). Logarithms were therefore taken of the pressures and corresponding gas rates, and by the usual mathematical methods the best-fitting straight line was calculated to pass through the points representing the observations with each nipple; and from the slope of this line the value of B was determined.

A formula of the above type, with the insertion of the appropriate values for the constants, gave a more accurate representation of the results over the whole pressure range than any of the square-root formulæ, although the relation found may be purely empirical. Even with this formula, however, the difference between observed and calculated values for discharge frequently exceeded 1 p.ct. over certain ranges; and the deviations were such as to suggest that the formula did not represent the best curve through the observed points (by method of derivation it was the best *simple exponential* curve), and that a more complex formula would be required. The matter was, however, not followed further.

In the Tables which follow, particulars are given as to the nipples used and the results obtained.

Dimensions of Orifices in Gas Nipples Tested.

Nos. 1—6.—Intended for burners with No. 2 (medium) mantles.
,, 7—11.—Intended for burners with universal mantles.
,, 12—15.—Miscellaneous nipples.

No. of Nipple.	Mean Diameter of Orifice. Inches.	Mean Thickness of Wall at Orifice. Inches.	Thickness. Diameter.
1	0·0357	0·025	0·70
2	0·0350	0·021	0·60
3	0·0350	0·034	0·97
4	0·0358	0·028	0·78
5	0·0351	0·020	0·57
6	0·0355	0·032	0·90
7	0·0601	0·034	0.57
8	0·0581	0·036	0·63
9	0·0593	0·028	0·47
10	0·0597	0·031	0·53
11	0·0598	0·034	0·57
12	0·0435	0·024	0·55
13			
14	0·0476	..	..
15			

Nos. 1—6 and 7—11 are nominally all of one size.

In looking over the indices for the discharges from plain circular orifices (*i.e.*, nipples with needles removed), it will be observed that they range from 0·45 to 0·53. One would hesitate, however, to ascribe these variations to experimental error and take an average of the whole series, for it is evident that the low values for Nos. 6 and 7 could be repeated, as could the high value for No. 13. These indices are therefore characteristic of the nipples in question. Careful examination, however, failed to disclose any mechanical differences in the nipples which would satisfactorily account for the observed changes in the indices, and even greater variations may very well be expected in practice, when one remembers the care with which the above nipples were selected and prepared. There are in the table, however, comparatively few examples of indices greater than 0·5.

From columns 5 and 7 it would appear that the index is very little altered by insertion of the regulating needle into the orifice, although the figures in column 7 show, if anything, rather less variation than those in column 3, with a general average slightly below 0·5—say, 0·48.

The conclusions to be drawn from the figures below are that the relation between discharge and gas pressure for

Discharge of Gas through above Nipples.

Determined for gas of sp. gr. 0·475 at moment of discharge. (Dry air at 60° Fahr. and 30·0 in. barometer, = 1·00).
The table gives the values of A and B in the expression $q = Ap^B$.
Where q = gas rate in c.ft. per hour.
p = pressure behind nipple in. w.g.

No. of Nipple.	No Regulating Needle Inserted.		Maximum Opening with Needle Inserted.		Needle Adjusted to give Working Gas Rate.	
	A.	B.	A.	B.	A.	B.
1.	2.	3.	4.	5.	6.	7.
1	1·779	0·472	1·726	0·472	1·381	0·473
2	1·594	0·490	1·335	0·470	1·335	0·470
3	1·774	0·515	1·764	0·491	1·363	0·473
	1·787	0·489				
	1·798	0·490				
4	1·811	0·490	1·828	0·468	1·365	0·470
	1·857	0·474				
	1·860	0·475				
5	1·768	0·490	1·788	0·494	1·369	0·494
					1·116	0·514
					1·226	0·503
6	1·712	0·466	1·730	0·454	1·396	0·450
	1·765	0·452			1·339	0·452
	1·750	0·460				
	1·767	0·455				
7	4·794	0·452	4·499	0·461	3·182	0·468
	4·792	0·458			3·257	0·470
	4·804	0·453				
8	4·663	0·479	3·961	0·487	3·220	0·487
9	4·984	0·477	4·277	0·483	3·159	0·483
10	4·811	0·466	4·320	0·480	3·156	0·486
11	4·635	0·467	4·417	0·472	3·188	0·471
12	2·813	0·468	2·710	0·473	2·097	0·478
13	4·263	0·528	4·170	0·526	3·173	0·496
	4·252	0·530			3·190	0·491
					3·193	0·496
14	3·519	0·506	..	..	..	..
	3·504	0·509	..	..	..	..

nipples of the above type may be represented approximately by a formula of the type $q = Ap^B$, but that the index B as well as the coefficient A will be different with different nipples, and will usually be slightly below 0·5. This must be taken into account in precise work, and will involve a determination of the characteristics of the particular nipple in which we may be interested, especially if aeration is in question.

On the other hand, for general work, and for calculating changes in gas rate and thermal delivery to be expected for changes in pressure of (say) 1 in. w.g. above and below a working pressure for which a discharge has actually been measured, the usual assumption that the discharge is proportional to the square root of the pressure will probably suffice.

The following table shows the percentage error involved in assuming that the discharge is proportional to the square root of the pressure, if it should actually follow some other index. The table is arranged for all indices to give the same result at 2·5 in. pressure.

These discharge tests were made as preliminaries to aeration tests with lighting burners. There is no reason whatever for associating a high degree of aeration with a high index in the above formulæ, or expecting any relation between the two.

It was fully realized that the equations given only represented the relation between discharge and gas pressure. It might very well happen that a nipple would discharge its

Pressure and Gas Discharge.

Percentage correction to discharge rate calculated on basis of square root of pressure, if the true index of the exponential formula $q = Ap^n$ is that given at the head of each column. Agreement is made exact at 2·5 ins. w.g. for all indices, and the heavy line encloses all values for which the error is less than 1 p.ct.

p.	0·45	0·46.	0·47.	0·48.	0·49.	0·50.	0·51.	0·52.
0·5	+8·4	+6·7	+5·0	+3·3	+1·6	*Nil*	−1·6	−3·2
1·0	+4·7	+3·7	+2·8	+1·9	+0·9	*Nil*	−0·9	−1·8
1·5	+2·5	+2·0	+1·5	+1·0	+0·5	*Nil*	−0·5	−1·0
2·0	+1·1	+0·9	+0·7	+0·4	+0·2	*Nil*	−0·2	−0·4
2·5	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*
3·0	−0·9	−0·7	−0·5	−0·3	−0·2	*Nil*	+0·2	+0·3
3·5	−1·7	−1·3	−1·0	−0·6	−0·3	*Nil*	+0·3	+0·7
4·0	−2·3	−1·8	−1·4	−0·9	−0·4	*Nil*	+0·4	+0·9
4 5	−2·8	−2·3	−1 7	−1·1	−0·6	*Nil*	+0·6	+1·2
5·0	−3·4	−2·7	−2·1	−1·4	−0·7	*Nil*	+0·7	+1·4

gas in a rough and turbulent manner not favourable for highly efficient injection, or that the position of the gas stream as regards centring in the mixing tube or inclination to its axis might be at fault. There are independent sources of variation in the behaviour of injectors upon which discharge-pressure relations can furnish no information, and experimental determination of the degree of aeration is essential.

PART II.

SPECIFIC GRAVITY OF GASES.

In connection with the investigation of the aeration of burners, and the discharge of gases through orifices, it has been desirable to know with some accuracy the specific gravity of the gas being used. An error not greater than ±0·5 p.ct. was aimed at, or for a typical town gas (say) ±2 in the third decimal place of the density figure. This section of the report will be divided into three parts, as follows:

1. A description of the instruments used for the determination of specific gravity.
2. Details of the methods used.
3. A comparison of a number of specific gravity determinations by different methods.

1.—Instruments for Determination of Specific Gravity of Gas by Differential Column Method.

The determination is made by measuring the difference in the pressure exerted by a column of gas and a similar column of air, from which data the specific gravity can be calculated as will be shown later. The method has been known for a number of years (*e.g.*, see Threlfall, Proc. Roy. Soc. A. 77, 1906), but was revived and a convenient arrangement of apparatus described by Blackie in 1922 ("An Apparatus for the Measurement of the Specific Gravity of Gases in Small Quantities," Alfred Blackie, M.A.; Fuel Research Board, Technical Paper No. 5). Preliminary tests had been made and the applicability of the method to the requirements of our research was under examination when the 11th Report of the Gas Investigation Committee was presented last year (see pp. 26 and 33, 11th Report, 1924). The description which follows is that of the apparatus and procedure which we have since developed and found to yield satisfactory results. In the main it follows the paper already referred to, but with amplification of the working details.

Gas and Air Columns.

The gas and air columns were contained in copper tubes of ½ in. bore, surrounded by a water-jacket built up of 1½ in. iron piping as shown in fig. 20. The tubes are each about 20 ft. long, this giving a pressure difference which can be measured with a degree of accuracy comparable with that of the other measurements involved. As it was not possible to find accommodation for an apparatus of this height inside the laboratory, it was secured to the outer face of the laboratory wall near a window, the window-ledge forming a convenient foundation for the pressure gauge. Each tube terminates in a cylindrical box 1½ in. dia. by 1½ in. deep, provided with a diaphragm perforated with a ⅛ in. hole, and a similar hole in the base. These boxes are used to minimize the effects of diffusion of air into the tubes while a test is in progress, and the bases of the two boxes should be at the same level with the outlet apertures close together. With this arrangement the sensitive pressure gauge sometimes showed oscillations which made it impossible to obtain reliable readings; this was probably due to mutual screening of one box by the other when the wind was in certain directions, and to eddies set up near the water jacket. The boxes were therefore enclosed in an outer chamber with a single perforation in its base, this being covered with a loosely fitting baffle plate. With this arrangement sufficiently steady readings have been obtained even in windy weather. A third copper tube was also fitted into the jacket to act as the bulb of an air-thermometer, as described by Blackie; but in addition a thermometer pocket of the usual type was provided where the water entered the base of the jacket. This was fitted with a mercury thermometer graduated

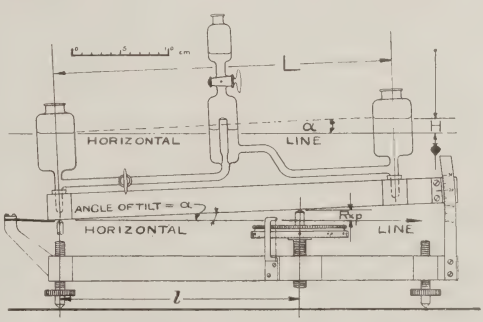


Fig. 18.—Outline diagram Chattock Gauge

in tenths of a degree Centigrade. With a good flow of water through the apparatus there was very little difference between the temperature of the water entering the jacket and that overflowing from the top—the excess rarely being greater than 0·5° C. The greatest error thus introduced is under-estimation of the mean temperature of the tubes by 0·25° C. Perforated distance pieces were provided for the tubes about every 18 in., the perforations being ½ in. holes alternately at the centre and near the circumference of successive spacers.

Chattock Tilting Gauge.

The instrument used for measuring the pressure difference between the columns was a tilting manometer of the Chattock type made to our designs by Messrs. Scientific and Projections, Ltd., the novel features of which were described and illustrated in the 11th Report of the Gas Investigation Committee (p. 25). Fig. 18 shows the essentials of the instrument.

As the result of continued experience in the use of the gauge, further improvements have been effected. Control of the illumination of the instrument is very important if consistent readings are to be obtained. This is now effected by enclosing the gauge in a case to exclude most of the extraneous light. The source of illumination is an ordinary pocket flash lamp bulb perma-

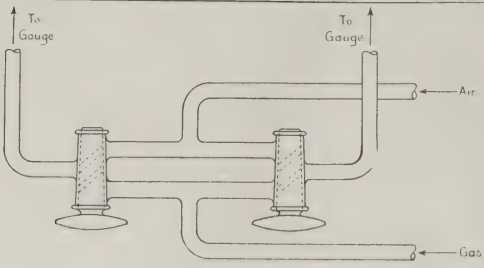


Fig. 19.—Change-over Cock System for Chattock Gauge.

nently fixed to the tilting member some 3 in. above the rear pivot, the light being directed as required by the mirror behind the centre vessel. Suitable wiring and a switch are provided. A black-paper collar encircles the upper part of the centre vessel and is adjusted by trial to cut off most of the light above the meniscus. The silhouette of the meniscus shows a very clearly defined line in the field of the microscope for setting, and, if the gauge is moved from place to place, trifling readjustment of the mirror is usually all that is required to reproduce the former conditions of illumination. The heating-up of the apparatus with such a source of light is negligible. The reading microscope is furnished with a Watson 1 in. parachromatic objective and a 6x eyepiece. This, with the usual microscope body-length, represents about as large a magnification as it is convenient to use, and only leaves about 1 mm. working distance between the objective and the walls of the centre vessel. A single silk fibre provides a suitable line in the eye-piece. Through the

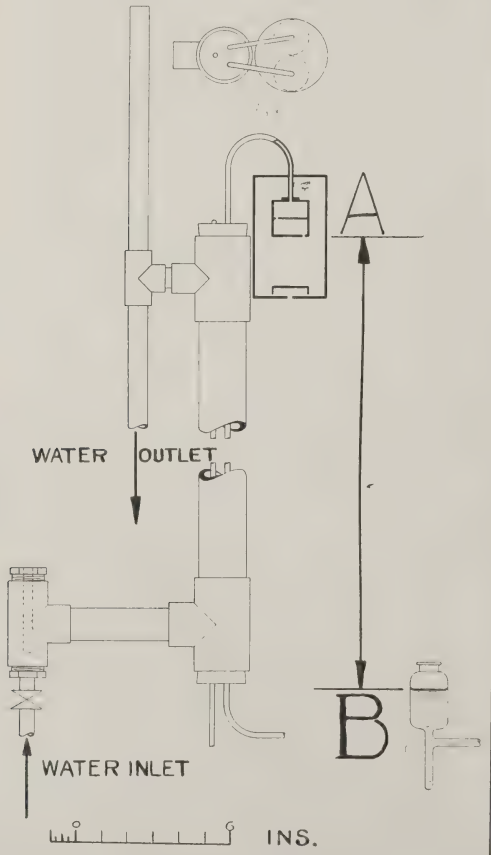


Fig. 20.—Water-Jacketed Gas and Air Tubes.

kindness of Dr. H. Hartley, our attention was called to a critical report upon a number of sensitive gauges used in the Aerodynamics Laboratory at the University of Toronto (School of Engineering Research University of Toronto, Bulletin No. 2, "Aerodynamic Papers," J. H. Parkin, 1921). As a result of this communication, it was decided to replace the castor-oil salt solution combination originally used in the gauge by one of "Nujol" and distilled water. "Nujol" is a proprietary brand of medicinal paraffin which we found to have a viscosity only about one-tenth that of castor oil; and it is immiscible with water. The density of the sample in use is 0·883 at 60° Fahr., changing with temperature at the rate of 0·00035 per °Fahr. The meniscus at the junction of the "Nujol" and water remains well-defined and free from scum over long periods, and accurate settings of the gauge are therefore facilitated. The use of a gauge liquid like distilled water, with well-known physical properties, also has much to commend it. Trouble was experienced at first owing to the solution of tap-grease by the "Nujol." The latter alone was, however, found to be a suitable lubricant for well-ground taps if these were not pressed too heavily into their seats, the taps turning with very little effort, and so causing the minimum disturbance of the gauge.

In our original gauge an attempt was made to secure sensitivity by making the innermost tube of small diameter—3 m.m. internal. The gauge responded quickly to small pressure changes, but the movement of the meniscus for a given tilt of the gauge was, contrary to expectations, small and irregular. This is to be associated with surface-tension phenomena. In the latest instrument, the bore of the inner tube has been increased to 9 m.m., and a meniscus height of 2 to 3 m.m. is used. Under these conditions, settings can be repeated easily to within ± 0·2 divisions of the micrometer head—*i.e.*, to ± 0·003 m.m. w.g.—and the time required for the gauge to take up its final reading is less than 15 seconds.*

At a convenient place in front of the gauge a wooden block has been secured to the bottom of the case. This carries two two-way cocks sealed together as indicated diagrammatically in fig. 19, connections being made permanently between these and the gauge by short flexible pieces of rubber tubing. It will be seen that this arrangement allows the gauge to be isolated; either limb can be supplied very expeditiously with gas or air at will, and both limbs can be subjected to the same pressure or to atmospheric pressure. Further, as connections are made from other apparatus to this cock system and not directly to the gauge, there is no risk of disturbing the adjustments of the latter while re-arranging connections, or by an accidental pull on the connecting tubes.

We have found that, when subjected to a rising temperature, the gauge exhibits a drift of zero which is by no means negligible. The amount of drift for a given change in temperature will depend upon the dimensions of the gauge, the nature and quantities of the liquids used for filling, and to some extent upon its initial temperature. A precise value cannot therefore be given. Experiments specially conducted for the purpose show, however, that for our manometer the drift is of the order of 2 micrometer divisions per °Fahr. change in temperature of the instrument. It is thus important that the temperature of the instrument should be kept constant during observations, or that the temperature should change slowly and steadily, so that an attached thermometer may indicate the temperature of the gauge with reasonable accuracy. A thermometer has been fitted to the gauge and surrounded by a water jacket which is made approximately of the same dimensions as the central vessel by the side of which it is mounted. It is not intended that the figure previously given for zero drift (2 divisions per ° Fahr.) should be used for the calculation of corrections. It is preferable that frequent zero checks should be made, together with temperature observations. The correction to intermediate readings can then be made in accordance with temperature readings made at corresponding times. It would be

* One revolution = 100 divisions on head = 1 m.m. lift on screw (approx.) = 1·4 m.m. w.g. difference in pressure.

Example of Determination of Specific Gravity of Town Gas.

	Micrometer Reading.	Temperature. Gauge.	Temperature. Columns.
	9·078, 78, 74 — 9·077 Mean; − 0·001 Corr. for screw error; 0·000 ,, ,, zero drift	49·1° Fahr.	..
1st Zero Reading	9·076 Corrected		
	11·864, 62, 62 — 11·863 Mean; 0·000 Corr. for screw error; + 0·005 ,, ,, zero drift	49·4° Fahr.	5·52° C.
1st Gas Reading	11·868 Corrected		
	11·855, 59, 58 — 11·857 Mean; 0·000 Corr. for screw error; + 0·010 ,, ,, zero drift	49·7° Fahr.	5·50° C.
2nd Gas Reading	11·867 Corrected		5·51° C.
	9·064, 60, 62 — 9·062 Mean; − 0·001 Corr. for screw error; + 0·015 ,, ,, zero drift	50·0° Fahr.	
2nd Zero reading	9·076 Corrected	49·5° Fahr. Mean = 9·7° C.	5·51° C. Mean −0·02° Corr. = 5·49° C.

Correction for Zero drift = $\frac{+\ 0\cdot015}{0\cdot9}$ = 0·017 per °Fahr. Barometer, 29·74 in. at 64° Fahr. = 29·65 in. corrected.

11·868 1st gas reading	11·867 2nd gas reading
9·076 1st zero ,,	9·076 2nd zero ,,
2·792 Difference.	2·791 Difference.

2·7915 = Mean pull of gas column expressed in turns micrometer head.

2·7915 × 1·422 = 3·969 = Vertical displacement of water surfaces in m.m.

3·969 = Equivalent in m.m. w.g. at 4° C.

$$6221 \times 0\cdot001293 \times \frac{273}{278\cdot5} \times \frac{29\cdot65}{29\cdot92} = 73\cdot394 \times \frac{29\cdot65}{278\cdot5}$$

= 7·814 = Pressure due to air column under the same temp. and pressure conditions as in the gas colum (m.m. w.g.)

Then specific gravity of gas*

$$= 1 - \frac{3\cdot969}{7\cdot814} = 1 - 0\cdot5079$$

$$= 0\cdot4921.$$

* Wt. of 1 c.ft. of dry gas. / Wt. of 1 c.ft. of dry air. under the same conditions of temp. and press.

possible by suitable alteration of the relative sizes of the central and one of the outer vessels greatly to reduce this zero drift, but exact compensation could not be expected over a wide range of working temperatures. In addition to correction for zero drift, any considerable change in temperature will entail a correction for change in density of the water in the gauge. This may be obtained from tables (*e.g.*, Kaye and Laby's "Physical and Chemical Constants, 1918," p. 22), although the change may be neglected between 0° and 20° C., unless the pressure is required to a greater degree of accuracy than ± 0·2 p.ct.

The pressure exerted by a column of typical town gas of specific gravity 0·5 and length 20 ft. will be slightly under 4 m.m. w.g. For a determination of specific gravity to within ± 0·5 p.ct. it can be shown that this pressure must be known to within ± 0·02 m.m. w.g. Actually the pressure is obtained from the difference of two readings, each of which must therefore be known to within ± 0·01 m.m. w.g., *i.e.*, to within ± 0·7 divisions on the micrometer head. This, it should be emphasized, is the accuracy with which the absolute magnitude of the whole pressure reading should be known, and is distinct from the smallest *variation* in pressure which can be definitely measured on the gauge, previously given as ± 0·2 micrometer divisions. Very careful standardization and calibration of the gauge are therefore demanded in order to obtain pressure readings correct within the above limits. A description of the details of the calibration would be unduly lengthy, but it consisted essentially in mounting a mirror on the tilting member, and treating the system as an optical lever; the tilt for various micrometer settings being determined to about ± 1 second of arc, or ± 0·15 micrometer divisions. It may be mentioned that for several months the gas densities obtained by the use of this gauge were systematically higher by about 1 p.ct. than those obtained by other methods, this difference being about double the estimated experimental error. As a result of our calibration, the tilt of the gauge was found to correspond with a mean micrometer pitch of 1·0108 m.m., whereas we had previously assumed that the pitch of the screw was in accordance with our specification—viz., 1·00 m.m. Upon re-calculating the densities with the revised figure for the screw-pitch, the various methods gave results in good agreement with one another.

The gauge thus developed can hardly be regarded as portable in the ordinary sense of the word, but it may nevertheless find additional applications in the gas industry when it may be necessary to measure small pressure differences with precision. Among these may be mentioned pressures in burners, flue draughts exerted by gas appliances, ventilator suctions and pressures, Pitôt tube measurements, and the standardization of other types of sensitive gauges.

2.—Method of Making Specific Gravity Determination.

The water flow is established through the jacket surrounding the differential columns; the Chattock gauge is set up and adjusted by its longitudinal and cross levels; and the microscope set so that the image of the meniscus is approximately on the cross-wire. Between the gauge and the differential columns, two straight tubes about 10 in. long and ⅜ in. dia., filled with calcium chloride, are placed horizontally and on a level with the surfaces of the water in the gauge. These serve to dry the gases entering the columns, and will remain effective for a considerable number of determinations. The control cock on the horizontal limb of the gauge is closed, and air is forced through the space in each end vessel and drying tube into the corresponding differential column. The air is conveniently supplied from an aspirator bottle; and about 2 litres through each tube, taking 3 to 5 minutes, is usually sufficient before determining the first zero reading of the gauge. The two taps permitting the air-flow are closed, and with one hand on the micrometer head the observer cautiously opens the control cock on the gauge, care being taken to keep the image of the meniscus near the line in the microscope eye-piece by manipulation of the micrometer head. The meniscus is then set as closely to the line as possible, and a reading on the micrometer head is taken. With the cock still fully open, the micrometer head is moved some 5 divisions, after which the meniscus is re-set to the cross line and the micrometer head is again read. A third setting and reading are made, and the temperature of the instrument is noted. The mean of the three readings constitutes the "first zero reading." The control cock on the gauge is next closed, and the gas which is to be exam-

ined is passed through one tube only, for 3 to 5 minutes. It will be found that the small copper tubes present a considerable resistance to the flow of the gas; and with an available pressure of about 5 in. w.g., gas will pass through the system at the approximate rate of only 1·7 c.ft. per hour, *i.e.*, about 2 to 3 litres of gas will be used. This is no disadvantage, however, as the drying of the gas by calcium chloride might not be satisfactory at greater speeds. During the last minute of this period, air should be passed through the other column. The gas and air are shut off, and three micrometer settings, together with a temperature reading of the instrument, are taken as in the case of air. The mean gives the " first gas reading." At the same time the temperature of the differential columns should be noted to 1/10°C., and the barometric height should be observed. If an approximate sp. gr. only is required, these two sets of readings will furnish the necessary data.

It is our practice, however, to close the control cock on the gauge and repeat the passage of gas for a further 3 minutes, and obtain a " second mean gas reading " from three settings in the same way. This is a safeguard against a faulty micrometer setting in the first test, or inadequate clearing of the gas tube from air. The control cock is closed, and both limbs are then swept with air for a further 3 minutes, thus restoring the apparatus to its original state; and from three settings a " second mean zero reading " is obtained, together with the corresponding temperature. Assuming that the meniscus has not been subjected to any violent displacement, the difference in the two zero readings indicates the extent of the zero drift. If, through faulty manipulation, the meniscus should be seriously disturbed, it is better to wait a few moments for the instrument to settle, and reject any difference figure obtained from values including the period of such disturbance. The calculation of the result is best illustrated by a worked example.

From the foregoing description the upper part of the table should be quite clear. The second correction—correction for screw error—is obtained from calibration data, and converts the micrometer reading into the equivalent reading on a perfect screw of the same effective mean pitch as that of the screw in use. The temperature corrections are obtained by comparison of the thermometers used with an N.P.L.–standardized thermometer. The barometric height should be accurate to 0·05 in. at least, so that the observed height must be reduced to standard conditions. The principal correction will be the temperature correction (for English barometers, mercury to 32° Fahr., brass scale to 62° Fahr.), usually involving a deduction of about 0·07 to 0·10 in. from the observed height. The factor 1·422, by which the mean micrometer difference is multiplied, is known as the " constant of the gauge." It is derived from careful determination of the dimensions indicated on fig. 18.

L = distance between the centres of the water surfaces in the outer vessels.
l = distance between line joining fixed pivots and axis of micrometer screw.
p = effective mean pitch of screw.
R_1 = first micrometer reading.
R_2 = second " "
$R = (R_2 - R_1)$ = turns of micrometer screw.
H = lift of water surface in right-hand vessel above that in left-hand vessel.
D = sp. gr. of liquid filling gauge (water at 4° C. = 1·00). The water and not the " Nujol " must be considered here.
α = tilt of gauge from horizontal.

Then pressure indicated by gauge
$= HD = LD \sin \alpha = LD \tan \alpha \cos \alpha$.
But if α is small, say less than 2°, we may write without significant error,
$= LD \tan \alpha = LD\ R_1 \frac{p}{l}$.
The pressure is obtained as a difference of two readings, thus—
$$P = L.D\,(R_2 - R_1)\,\frac{p}{l}.$$

$L.D\ \frac{p}{l}$ is a constant for any particular instrument, and is the " constant of the gauge." Had the temperature of the instrument been 15° C., for example, instead of 9·7° C., the density of the water would have been only 0·999, and consequently the value 3·969 would have been reduced to 3·965 in the second entry, to obtain the pull in m.m. of water of standard density. For 9·7° C. the correction is only 2 parts in 10,000, and is consequently negligible.

The next line in the table is a calculation of the pressure exerted by a column of air at the same temperature and pressure as the gas and of the same height. The height in question is that marked AB in fig. 20, and must be measured vertically and known to within a few millimetres. Where the apparatus is installed in a permanent position, it is convenient to measure once for all the height from the base of the diffusion boxes to the surface of the slab carrying the gauge. The distance from the slab to the mean height of the surfaces of liquid in the gauge is then deducted. This may differ slightly from time to time according to the filling and adjustment of the gauge, and is more easily checked than the whole height. In our apparatus as at present installed, the distance is 6221 m.m. (= 20 ft. 5 in. approx.).

0·001293 is the weight in grammes per c.c. of pure dry CO_2—free air at 0° C. and 760 m.m. pressure; 273 is the absolute temperature corresponding to 0° C., and 278·5, that corresponding to 5·5° C., the temperature of the columns; 29·65 is the corrected observed barometric height, and 29·92 the equivalent in inches of 760 m.m.

It is clear that for a particular installation a number of these factors will be constant, so that the arithmetical work in practice is much shorter than in this example. Thus, for our apparatus, the expression for the pressure due to the air column reduces to $73{\cdot}39\ \frac{B}{T}$ m.m. w.g. where B and T are the barometric height and absolute temperature of the gas column respectively.* If the weight of the water column indicated by the gauge is deducted from the calculated weight of the air column, the difference must be that of the gas column, since the apparatus is in equilibrium. The ratio of the weight of the gas column to that of the air column (or their equivalents in m.m. w.g.) gives the sp. gr. of the gas. A slight re-arrangement of the data gives an expression which can be calculated with less labour, viz. :—

$$\text{Sp. gr.} = \frac{\text{wt. of gas column.}}{\text{wt. of air column.}} = \left[1 - \frac{\text{wt. of water column.}}{\text{wt. of air column.}}\right]$$

The accuracy of the determination will be indicated later (section 3 below) when comparing the specific gravity values obtained by different methods for a number of gas samples.

It has been pointed out that the gauge reading may be doubled by modifying the procedure, and passing gas and air alternately through the right and left hand differential tubes. While this is true, it may require an inconveniently large tilt on the gauge, a correction for zero drift cannot be applied with the same certainty, and the gauge liquid is likely to become contaminated with gas to a serious extent if not swept with air from time to time. Sufficiently accurate readings can be obtained with 20 ft. tubes without adopting this plan.

3.—Comparison of Specific Gravity Determinations by Different Methods.

In the table which follows, a number of comparative specific gravity determinations are given covering a period of several months, these having been made in the course of other experiments. Samples of gas mixtures were taken simultaneously, and the determinations were made by alternative methods selected from the following :—

(i) *By the differential column method* already described.

(ii) *By gas analysis.* For this purpose the analysis was made as carefully as possible, each constituent was calculated to the second decimal place, corrected as indicated in Appendix I., and then rounded to the nearest 0·1 p.ct. C_mH_n was assumed to have a density 1·3 (air=1).

(iii) *By weighing* the carefully dried gas in sealed bulbs of about 290 c.c. capacity.

It was originally intended that this should form the standard with which the other methods might be com-

* $(6221 \times 0{\cdot}001293 \times \frac{273}{29{\cdot}92} \times \frac{B}{T} = 73{\cdot}39\ \frac{B}{T}$ m.m. w.g.)

pared. The tests occupied much time and were executed with every care and precaution. Reviewing the whole of the conditions, however, and the limitations of the instruments available, it is doubtful whether we should be justified in ascribing to these figures a greater precision than ± 0·002, although it is possible that they are correct to ± 0·001.

A few further tests have been made with an effusimeter; but there seems to be no ground for altering the opinion of this instrument already expressed in the 11th Report (p. 33)—namely, that while it will on most occasions yield results which are comparative, or even close to the correct result, it is liable to be erratic in its behaviour, and consequently cannot be relied upon for any but the roughest estimations of specific gravity.

Comparative Specific Gravity Determinations.

1.	2.	3.	4.	5.	6.
Differential Columns.	Weighing.	Analysis.	1–2.	1–3.	3–2.
·4855	·4925	..	−0·0070	..	..
·4856	·4916	..	−0·0060	..	..
·4846	..	·4903	..	−0·0057	..
·4922	·4911	·4914	+0 0011	+0·0008	+0·0003
·4852	·4874	·4848	−0·0022	+0 0004	−0·0026
·4769	..	·4768	..	+0·0001	..
·4800	..	·4816	..	−0·0016	..
·4921	·4963	..	−0·0042	..	..
·5002	..	·5000	..	+0·0002	..
Mean . .	..	..	−0·004	−0·001	−0·001

Each horizontal line in the above table refers to an independent gas sample. There is, therefore, no point in averaging columns 1, 2 and 3 respectively. In every case no importance attaches to the fourth figure in the values given; they are merely retained to prevent an accumulated error due to rounding-off at too early a stage.

The specific gravities by analysis are probably not in error by more than ± 0·002. With one exception, the specific gravity by the differential column apparatus and by analysis (column 5) agree within these limits, there being a tendency for the differential column method to yield slightly low results. On only two occasions have determinations been made by weighing and analysis on the same gas sample, and the comparisons show the specific gravity determinations to be in satisfactory agreement (column 6), weighing yielding, if anything, a slightly higher value. The probable error of the weighing method has been estimated above at ± 0·001 to ± 0·002. The mean difference between weighing and differential columns (column 4) is only 0·004, or about 0·8 p.ct. on gas of sp. gr. 0·49. The first two values in column 4, however, refer to determinations made at a comparatively early date when the technique of the method was not fully developed. It is probable, therefore, that 0·002 or 0·003 more nearly represents the mean difference in the two methods, while, if allowance is made for the difference between the results by analysis and by weighing, the mean discrepancy would be only 0·001 or 0·002. The differential column method is liable to certain small errors (*e.g.*, diffusion of gas and air into end boxes; removal of CO_2 by gauge water; unequal lengths of gas and air columns as gauge tilts; underestimation of temperature of columns), difficult to determine individually, but collectively amounting to the equivalent of 0·001 or 0·002 on the specific gravity, and usually acting in the direction of giving a low value. Bearing this in mind, the three methods may be regarded as yielding results in excellent agreement, usually within 0·002, although the discrepancy may occasionally reach 0·005—*i.e.*, 1 p.ct. on a typical town gas of sp. gr. 0·5.

Summarizing.

The weighing method cannot be regarded as suitable for technical work, and in practice is not likely to be more accurate than the other methods.

An accurate gas analysis will allow the specific gravity to be calculated to within ± 0·002, but an analysis of the requisite precision cannot be executed in less than one hour, even by a skilled operator.

The differential column apparatus provides a means whereby the specific gravity can be conveniently determined within ± 0·002 of its true value, and in a comparatively short time (say, 20 minutes). Our experience with the apparatus is thus in general agreement with that of the Fuel Research Board, as indicated in its Technical Paper No. 5.

Note on Definition of Specific Gravity of Gas.

If it is desired to express the specific gravity of a gas to 1 p.ct. or more closely, careful definition of the property in question is necessary. The specific gravity is usually defined as the ratio of the weight of 1 c.ft. of gas to that of an equal volume of air at the same temperature and pressure.

All our specific gravity values are quoted for dry gas compared with dry air; and the value so obtained is practically independent of the choice of any particular temperature and pressure, so long as these are the same both for gas and for air.

In practice, gas carries a certain amount of water vapour, frequently being fully saturated. The specific gravity is therefore sometimes defined as the ratio of the weight of 1 c.ft. of gas to that of 1 c.ft. of air at the same temperature and pressure, both being saturated with water vapour. This ratio, however, is not a constant, altering appreciably with temperature, and somewhat less so with the usual changes in barometric pressure; the effects being more marked the further the density of the gas departs from that of air. It is on account of this variation that the difficulty is not removed by specifying a standard temperature, pressure, and saturation—*e.g.*, 60° Fahr., 30 in. pressure, and full saturation for both gas and air, a point which is sometimes overlooked.

Effusimeters usually work with water as the confining liquid, both gas and air therefore being moist. The specific gravity obtained with such an instrument for a particular gas will therefore not be the same, even when the effusimeter is working satisfactorily, as by the three methods given in this report. The order of the difference is indicated below, and is about 1 to 1½ p.ct. for ordinary town gas.

Sp. Gr. of Gas on Basis $\frac{\text{Dry Gas}}{\text{Dry Air}}$ (Taking Dry Air = 1·00.)	Sp. Gr. of Gas on Basis $\frac{\text{Sat. Gas}}{\text{Sat. Air}}$ (Taking Sat. Air at 60° F. and 30 In. = 1·00.)	Sp. Gr. of Gas on Basis $\frac{\text{Sat. Gas at 60° F. 30 In.}}{\text{Dry Air at 60° F. 30 In.}}$
0·400	0·406	0·404
0·500	0·505	0·502
0·600	0·604	0·600

Given the dry gas value, which is a constant, it is $\frac{\text{dry gas}}{\text{dry air}}$ of course always possible to calculate the true density of the gas for any specified temperature, pressure, or degree of saturation.

It will be seen from column 3 of the table above that for ordinary town gas under average atmospheric conditions in this country, the specific gravity of the gas as frequently used (namely, moist) compared with dry air, differs but slightly from that of the dry gas compared with dry air. The use of dry air as the basis of comparison also has the convenience that data for the weight per c.ft. of dry air under various conditions of temperature and pressure can be obtained from tables, or may be very easily calculated.

APPENDIX I.

Notes on Precise Gas Analysis.

In our aeration and other investigations accurate gas analyses have been of vital importance. The following critical review of the methods of analysis we have employed may, therefore, be of interest. The notes apply to analyses conducted in a Bone-Wheeler apparatus of the usual dimensions (graduated length of pressure limb 600 m.m., capacity of burette to "constant volume" mark 75 c.c.), and assume an original gas pressure of about 500 m.m. mercury. All combustions were made

over copper oxide in a silica tube. The chief advantages of this method of combustion are that a much larger volume of gas can be burned than by explosion, thus giving greater accuracy in measurement; combustion can be extended over sufficient time to secure completion; there is no careful adjustment necessary to secure the right composition of an explosive mixture; no auxiliary supply or analyses of oxygen are required. The feature which distinguishes this process from those of other workers using copper oxide combustion lies in the evacuation of the combustion tube before and after combustion, using the gas burette as a mercury pump.

After critical examination, the method was extensively used by us for the determination of nitrogen, and was first reported upon, briefly but favourably, by Mr. James W. Wood in the First Report of the Gas Investigation Committee (1918, p. 76); no details, however, being there given. The apparatus was described at a later date by Dr. E. W. Smith, to whom we were indebted for the essentials of the process before publication ("Gas World," 1919, Vol. 71, p. 342), and was again described and illustrated by Dr. Parker in the 4th Report of the Gas Investigation Committee (pp. 316-317).

For the purposes of the present inquiry an attempt has been made to conduct gas analyses in which each constituent should be determined to within ± 0·05 p.ct., the final results being returned to the nearest 0·1 p.ct. To do this without making a number of analyses and averaging the results calls for very precise working, and certain systematic errors must be carefully eliminated.

There is no difficulty in reading the gas burette to ± 0·1 mm., *i.e.*, to ± 0·02 p.ct. on the gas volume; but even if a temperature correction is applied (and temperature variation is the commonest source of erratic results), this does *not* represent the precision of the analysis.

In 1918, 1919, and 1920, we were making very frequent determinations of nitrogen by combustion of the *whole* of the gas over copper oxide, and measurement of the residual nitrogen using this apparatus. Even at this early date it was observed that the nitrogen figure so obtained was consistently 0·3 to 0·5 p.ct. lower than when the nitrogen was similarly determined at the end of a complete analysis involving absorption of CO_2, hydrocarbons, O_2, and CO in the usual way, before combustion. Such accumulation of nitrogen was attributed to air or nitrogen dissolved in the reagents (evidence of the freedom of the apparatus from leaks being satisfactory), and an attempt was made to remove this by placing the reagents in communication with an evacuated vessel immediately before use. For obvious reasons this treatment cannot be applied either to bromine water or ammoniacal cuprous chloride solution.

Some reduction in the nitrogen discrepancy was effected, but the process was abandoned, as it complicated the analysis and introduced certain other small errors. Since 1918 the methods of manipulation have been improved, and the amounts of reagent have been reduced to the minimum compatible with satisfactory and reliable absorption. Nevertheless, the "direct" nitrogen is still always slightly less than the nitrogen residue at the end of a complete analysis; the discrepancy being remarkably constant, and usually lying between 0·2 and 0·3 p.ct., when a prescribed routine is followed. This amount should certainly be deducted from the nitrogen figure and added to the values for the absorbable constituents, but its distribution is open to discussion. In the absence of precise information on the point, it has been our custom to divide the discrepancy among the absorbable constituents, in proportion to the volume of reagent used for each—thus, CO_2: C_mH_n: O_2: CO., 1: 3: 2: 4. The most important correction is the addition of nearly 0·1 p.ct. to the unsaturated hydrocarbons, having regard to its effect upon C.V. and air requirement.

In certain analyses we were surprised to find small amounts of oxygen where complete absence of oxygen was expected. It was then found, by carrying out all the operations of a complete analysis with a sample of pure nitrogen or hydrogen, that if the bromine water was more than a few hours old, and had been exposed to light, there was an evolution of gas equal to 0·10 to 0·20 p.ct. of the gas taken—presumably oxygen, since it could afterwards be absorbed by pyro. Such evolution would seriously reduce the percentage of unsaturated hydrocarbons obtained by the analysis, and would give misleading figures for oxygen content in the next absorption (O_2), especially when controlling the small amounts of excess oxygen in purified gas, where revivification *in situ* is practised. This difficulty has been overcome by preparation of the bromine solution in small quantities immediately before use.

Upon a number of occasions the combustion after the removal of CO has been conducted in two stages—(i) at a barely perceptible red heat, (ii) at a bright red heat—with suitable pumping and measurement after each stage. Hydrogen burns quite readily over copper oxide at a dull red heat, and the contraction in volume is a direct measure of the amount of hydrogen present. After the second combustion at a higher temperature, there is usually an increase in volume, as might be expected if paraffin hydrocarbons higher in the series than methane (CH_4) were present. This determination has been made repeatedly; and the gas produced by steaming in the vertical retort installations at Meadow Lane, Leeds, for example, usually contains about 1·3 to 1·5 p.ct. of such hydrocarbons expressed as ethane (C_2H_6).

Ordinarily, the combustion is carried out in one stage, and the whole of the CO_2 produced is calculated as methane. The hydrogen is, therefore, under-estimated to the extent of the volume of C_2H_6 present. This is of no great consequence, however, for it can easily be shown that the density and air requirement of the gas calculated from the conventional analysis (*i.e.*, expressing the whole of the paraffin hydrocarbons as CH_4) gives precisely the same result as that where H_2, CH_4, and C_2H_6 are given separately, while the calorific value calculated from the conventional analysis is slightly too low to the extent of 0·7 B.Th.U. per c.ft. for each 1 p.ct. of ethane present.

At a temperature adequate for the combustion of methane there is a copious evolution of oxygen from the combustion tube, so that any instruction to carry on the pumping of the tube until a vacuum of, say, 0·5 m.m. is attained, is useless. Such oxygen would give too high a value to the nitrogen, and a correspondingly low value to the hydrogen figure in a one-stage combustion, the error often reaching 5 p.ct. There are two ways of dealing with this matter. The first is to follow the final CO_2 absorption with pyro, deducting the oxygen found from the nitrogen, and adding it to the hydrogen. An alternative plan due to Dr. Parker is to complete the combustion and then extinguish the burner heating the tube, continuing, however, to pass the gas backwards and forwards through the tube until it falls below a dull red heat. This usually takes about 3 minutes, and the oxygen is re-absorbed practically quantitatively. The tube is then pumped off as usual. This latter scheme is admirable except when gases are being treated in rapid succession for determination of nitrogen only, when it is perhaps more convenient to keep the tube hot and absorb the oxygen and CO_2 together, with alkaline pyro, before measuring the nitrogen.

Another irregularity of the copper oxide combustion gave some trouble in making precise determinations of air-gas ratios for burner mixtures, which, it will be recalled, depend upon accurate determinations of the CO_2 produced per cubic foot of the gas in use and of the mixture formed respectively. Analyses were always made in duplicate, and it was observed that, whenever a freshly oxidized combustion tube was used, or whenever a CO_2-in-mixture determination preceded a determination of the CO_2 produced per c.ft. of gas, the CO_2 obtained was lower than in the confirmatory analysis which followed on another portion of the same gas sample. The discrepancy was of the order of 0·3 p.ct., and was therefore too serious to neglect. It will be realized that the residual atmosphere at the end of an analysis of a town gas containing 20 p.ct. of methane and 10 p.ct. of nitrogen will consist of 66 p.ct. by volume of CO_2; while that from the combustion of the original gas, no constituents having been absorbed, will contain over 80 p.ct. of CO_2. The gas burette

and its connections are kept moist in the first place, and there is, in addition, the water which is produced by the combustion of the hydrogen and hydrocarbons of the gas. These conditions must of necessity favour the retention of a certain amount of CO_2, despite the reduced pressure in the apparatus at this stage, and it is surprising that the amount retained is so small. If the CO_2 is absorbed and the CO_2–free residue (augmented by nitrogen or air if necessary to give an amount convenient to manipulate) is re-circulated through the combustion system and pumped off again, an amount of CO_2 will be recovered upon absorption with potash which corresponds closely, but not exactly, with the CO_2 discrepancy in the consecutive analyses. Such "recovered" CO_2 should plainly be added to the larger amount already determined. It is not clear whether any corresponding correction should be made to the H_2, CH_4, and N_2 in a complete gas analysis, however, and on what basis. This will depend upon whether the CO_2 is dissolved or is present as gas in the combustion tube and its connections when the earlier measurements are made. When, as in practice, a number of analyses of gases of approximately the same character follow one another, the amount of CO_2 retained in the apparatus is approximately constant, so that the error would only appear on the first of the series. Even this might be avoided by a preliminary blank or "conditioning" combustion, no measurements, of course, being necessary. Where, as in our air-gas ratio determinations, however, gases giving widely different CO_2-concentrations in the residue after combustion follow one another, this plan cannot be followed, and it has proved necessary frequently to determine this small amount of "recovered" CO_2 and employ an appropriate correction. The same considerations would apply, with modifications, to analyses conducted by explosion, and are not peculiar to combustion over copper oxide.

It is not possible to calculate the specific gravity of a town gas from an analysis without knowing something of the nature, as well as the quantity, of the unsaturated hydrocarbons. In our analyses no attempt has been made to separate or identify these by the use of several reagents of different chemical composition or strengths. Instead, however, an attempt has been made to determine their combined effective molecular weight, and hence their density. To do this, two partial analyses have been conducted. First, a direct combustion is made of a portion of the gas sample with a determination of the total CO_2, present and produced. Secondly, another portion of the sample is taken, the CO_2 present is determined, hydrocarbons are removed, and the residue is then completely burned. It is thus possible to determine the sum of the CO_2 present and that produced from all constituents except the hydrocarbons. The difference in the total CO_2 produced in the two determinations is that due to the combustion of the unsaturated hydrocarbons. Now one volume of C_mH_n yields $_m$ volumes of CO_2. From the above data, therefore, $_m$ is readily determined. This method does not give a value for $_n$, but it will usually lie between $_m$ and $2_m + 2$. The maximum variation in density due to the choice of a value for between these extreme limits is ± 5 p.ct; and as the amount of hydrocarbons in town gas is usually small, this approximate estimate of their density is sufficient. In a considerable number of analyses of town gas of C.V. 450 to 500 B.Th.U. gross per c.ft. which we have made by this method in Birmingham (1918-20), and Leeds (1924-5), the value of $_m$ keeps very close to an average value of 2·7. Assuming C_mH_n to be C_mH_{2m}, this leads to a mean density of 12·3 for the unsaturated hydrocarbons (air = 1·00).

APPENDIX II

Calculation of Air Injected and Products of Combustion Drawn in with Primary Air.

Assuming that the gas and air are both dry and the air free from CO_2,

Let a = vol. of CO_2 present in 1 vol. of dry gas.
b = ,, ,, ,, produced from combustion of 1 vol. of dry gas (including CO_2 already present—*i.e.*, a).
c = vol. of CO_2 present in 1 vol. of dry mixture of air and gas as determined by analysis.
d = vol. of CO_2 produced from combustion of 1 vol. of dry mixture over CuO. (including CO_2 already present—*i.e.*, c).
e = vol. of dry products of combustion from 1 vol. of dry gas (calculated from analysis and assuming all water condensed out).
f = vol. of water vapour produced by combustion of 1 vol. of dry gas.
x = vol. of dry air injected by 1 vol. of dry gas.
y = vol. of dry products of combustion drawn in per volume of dry gas.

Then $$a + y\frac{b}{e} = c\,(1 + x + y) \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

And $$b + y\frac{b}{e} = d\,(1 + x + y) \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

Whence $$x = \frac{ade - ab + bc - bce + b^2 - bd}{bd - bc} \quad . \quad . \quad . \quad (3)$$

And $$y = \frac{e}{b}\left(\frac{bc - ad}{d - c}\right) \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (4)$$

If CO_2 is present in the air of the room (as distinct from that produced in the neighbourhood of the burner by combustion), then it can be shown that (3) can be expressed in the form :

$$x = \frac{ade - ab + bc - bce + b^2 - bd}{b\,(d - c) - eg\,(d - c)} \quad . \quad . \quad . \quad . \quad . \quad (3^A)$$

And $$y = \frac{ae - ce - (ce - eg)\,x}{ce - b}$$

where g is the CO_2 present in unit volume of air.

If the air of the room is free from CO_2, and there is no injection of products of combustion with the primary air, the above expressions reduce to the very simple form—

$$x = \frac{b}{d} - 1.$$

Prof. J. W. Cobb, in introducing the report, said: Mr. James Wood has been following-up the subject of the aeration of burners. At first the treatment was of a very general character; but that was followed-up last year by a more special study of some of the burners used in heating appliances—such as the gas fire and ring burner. This year the study has been carried further, and typical lighting burners have been subjected to careful examination. The results are presented in this report. You will notice that at the beginning of the report we have followed what is now our usual custom of placing first an introduction and a summary, in which a general account is given of the experiments and their results. The mass of information in detail which has accumulated in the progress of the work, and is necessary for its complete understanding and setting-out, is then placed later in the body of the report, where it can be followed-up by an interested reader. I may say that much experimental ingenuity has had to be expended to enable these results to be obtained, largely because the lighting burner is a much smaller and more delicate thing than (say) a ring burner. Possibly the most remarkable result from one point of view (perhaps I call it that because it surprised me and Mr. Wood also) was that the amount of primary air injected by an ordinary lighting burner, working normally with a good illumination, was only about half the total air requirement. The significance of this is that obtaining effective illumination from the burner must depend very much on how the rest of the air is supplied; and so it shows what importance must attach to the accessory fittings, which help to determine the way in which the secondary air is supplied.

One of the essential factors in the whole of this study of aeration has been the density of the gas. The determination by the effusimeter is apt to be erratic; while the making of a complete gas analysis is a very tedious process. But the gas engineer should have a means of determining density, and particularly changes in density, of the gas that he supplies. Mr. Wood has given both time and thought to this determination, and has examined in great detail the applicability of the method which, in essence, has been known for a long time, and a form of which was described by Mr. Blackie, of the Fuel Research Board. Mr. Wood finds himself able to describe that method, when applied with proper precautions, as being accurate and comparatively rapid in working.

Mr. James W. Wood then presented an abstract of the report, upon which there was no discussion.

Prof. Cobb: I quite appreciate the difficulty of framing criticism of a report of a highly technical character at short notice. But I should be very sorry if on this account we were deprived of any criticism, which members can send forward to me in writing.

The report was adopted.

FOURTEENTH REPORT OF THE RESEARCH SUB-COMMITTEE OF THE GAS INVESTIGATION COMMITTEE.

THE EXPERIMENTAL GAS PLANT AT LEEDS UNIVERSITY.

SIR CORBET WOODALL MEMORIAL.

Adopted by the Committee, May 21, 1925.

[For "General Introduction" see the Thirteenth Report.]

Introduction.

In September, 1917, Mr. Henry Woodall made the generous offer to erect and present to the University of Leeds an experimental carbonization plant in memory of his father, the late Sir Corbet Woodall. This offer was gratefully accepted by the Council of the University; but the conditions prevailing at that time prevented the carrying out of the project. When circumstances became more favourable, Mr. Henry Woodall commenced operations, and the plant was officially presented to the University at the opening ceremony held on March 26 last year.

The lay-out of the installation was designed by Mr. J. F. Scott after consultation with Professor Cobb and others. The original idea that the memorial should take the form of an experimental plant was due to Mr. W. T. Dunn, of the Institution of Gas Engineers. In the first instance, the suggestion was to erect one setting of retorts only, but the scheme grew until finally two settings, including both horizontal and vertical retorts, were installed. The cost greatly exceeded the first rough estimate; but so many friends of the late Sir Corbet Woodall expressed a desire to help, that it has been possible to erect the larger plant and to have a surplus in the form of an endowment for any future extensions and alterations. There are five companies with which Sir Corbet Woodall was specially connected, the Gas Light and Coke Company, the British Gas Light Company, the Tottenham District Light, Heat, and Power Company, the Bournemouth Gas and Water Company, and the Croydon Gas Company; and they have all been most generous in their help. Messrs. Humphreys & Glasgow offered a carburetted water gas plant, but it was decided that the make of gas for the smallest practical unit would be too great. Mr. A. G. Glasgow, however, insisted on giving a handsome donation. Messrs. Clayton, Son & Co., Ltd., of Leeds, who built the gasholders, scrubbers, purifiers, &c., made a substantial gift in money and supplied the apparatus on most advantageous terms. The Woodall-Duckham Company gave the setting of vertical retorts, Messrs. Gibbons Bros., Ltd., of Dudley, presented the horizontal setting, and Messrs. W. Parkinson & Co. were responsible for the gift of a meter. Messrs. Bryan Donkin installed the machinery in the exhauster house. All those concerned with the plant gave every possible assistance.

The first utilization of the plant has been made by the Gas Investigation Committee.

Dr. Parker and his assistants commenced operations last year, when the work at Birmingham had been completed. In the first place the many smaller fittings necessary in an installation required for investigations of the nature it was proposed should be conducted, were added; then gas making and carbonization trials on the horizontal retorts were carried out, and at the same time the performances of the condensing, scrubbing, purifying apparatus, &c., were examined. *The installation is not in any way a small scale model of a gas-works,* but has many features which differ greatly from usual practice. It was therefore necessary that preliminary trials should be carried out before a research programme designed towards the solution of definite problems could be commenced. The preliminary trials of the horizontal setting and of the condensing and purifying plant, &c., have been completed, and some alterations have been made. As a result of these tests and alterations, the suitability of the horizontal setting and auxiliary plant as a carbonization unit has been established, and tests of the vertical retort setting are now in progress.

THE EXPERIMENTAL GAS PLANT AT THE UNIVERSIY OF LEEDS.

Sir Corbet Woodall Memorial.

See Illustrations appended.

The Corbet Woodall experimental gas plant occupies a site, provided by the University, adjoining the Department of Fuel and Coal Gas Industries. The general arrangement of the plant is shown in plan in Fig. 1. The installation includes a setting of two horizontal retorts, a setting of two vertical retorts, and the usual condensing and purifying plant.

The setting of horizontal retorts is housed in the main building, and the vertical retorts are situated in an open yard. The gas from the horizontal retorts or the vertical retorts passes through the pipes A or B, provided with valves, to the air condenser, whence it travels through the exhauster to the scrubbers, the purifier, the meter, and the holders. Tar and liquor collecting pots are provided at the positions marked C, D, and E; and drain cocks are placed at the points marked F, G, and H. A gas-fired boiler is situated near the vertical retort setting; the boiler feed tank is adjacent to the air condenser, and a water meter is placed at position J. A photograph of the front of the plant is shown in Fig. 2, Plate 6. In the foreground is the horizontal retort house, and behind this are the vertical retorts, the exhauster house, &c. In the background the framework of one of the gasholders can be seen.

Horizontal Retorts.—The arrangement of the horizontal setting and the method of heating are shown in Fig. 3, Plate 1, which gives vertical and horizontal sections and elevations. The setting, which was designed and erected by Messrs. Gibbons Brothers, Ltd., of Dudley, contains two fireclay retorts of circular section. Each retort is 6 ft. in length and has an internal diameter of 12 in. From Fig. 3 it may be seen that the setting consists of two exactly similar halves with one common chimney for the waste gases.

Each retort is heated by six burners supplied with coal gas—usually town supply—and with air from a compressor situated in the exhauster house. The amounts of air and fuel gas for each burner are controlled by separate cocks, and the two gases enter a mixing chamber before travelling upwards to the burner nozzle. The amount of air which can be supplied under pressure is less than that required for complete combustion, if lighting back and overheating of the burner are to be prevented. An auxiliary supply of secondary air is therefore necessary. The burner tubes projecting vertically from the mixing chambers are narrower than the openings in the brickwork through which they pass, with the result that some auxiliary air is drawn upwards around the tubes. When maintaining the retorts at a temperature of about 1000° C., a further quantity of auxiliary air is supplied through holes of $1\frac{1}{4}$ in. diameter in the inspection doors marked C in Fig. 3. These openings are fitted with 1-in. nipples so that they can be closed when desired by means of caps.

Each burner is placed vertically below a silica brick supporting the retort, which is thus not submitted to the direct cutting action of the flame. The burning gases are deflected by the silica brick in such manner that they are divided into two streams travelling on opposite sides of the retort. The products of combustion then travel over the top of the retort and past three damper plates to enter a

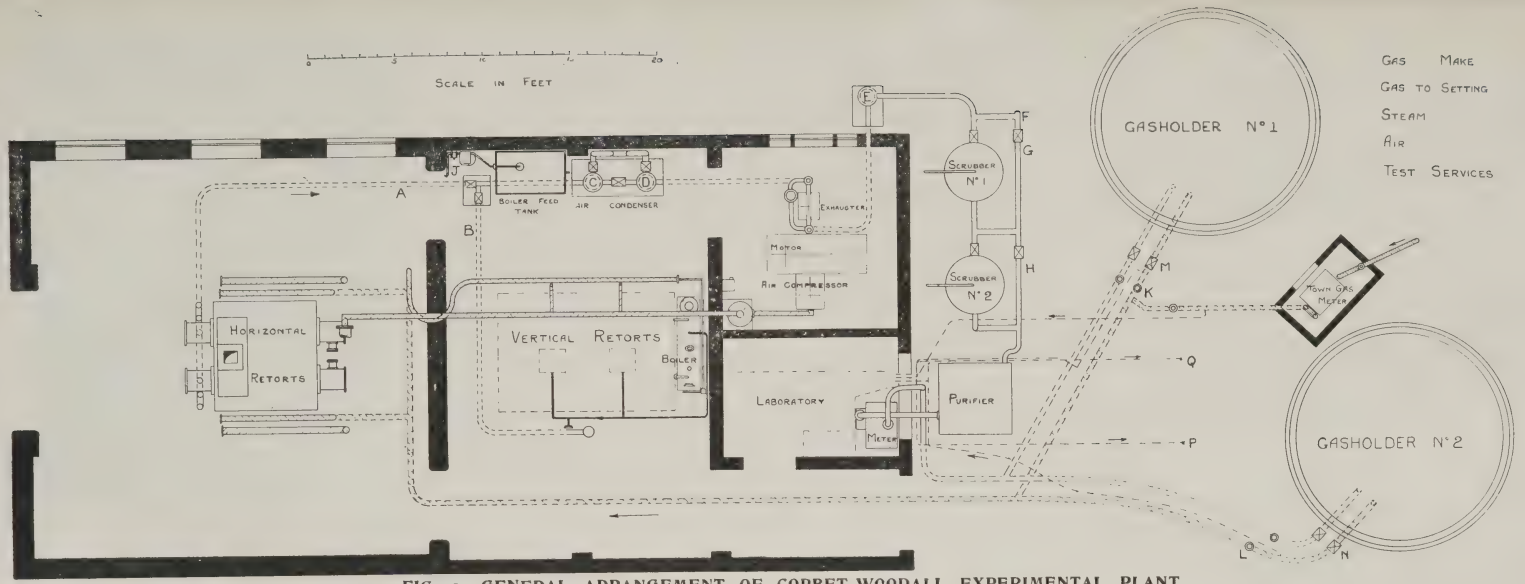


FIG. 1.—GENERAL ARRANGEMENT OF CORBET-WOODALL EXPERIMENTAL PLANT.

horizontal waste-gas flue on their way to the chimney, which is also provided with dampers. The air supplied to the burners is preheated by passage through a cast-iron pipe of 6 in. diameter, placed horizontally in the waste-gas flue above the retort.

It has already been mentioned that the retorts are 6 ft. in length. The end walls of the setting are 9 in. in thickness, so that the length of retort exposed to the heating gases is 4 ft. 6 in. Experience has shown that uniform heating of the retort can be secured over a total length of about 4 ft. This section of each retort, which can be kept at a uniform temperature, has a capacity of approximately 120 lbs. of coal with a heavy charge.

The mouthpiece of each retort projects 1 ft. 6 in. from the front of the setting, and is provided with a self-sealing door. The arrangement of the gas off-takes is shown in Fig. 4, Plate 2. According to this arrangement, the gas leaves the retorts by short descension pipes and then passes upwards through ascension pipes, each about 5 ft. in length, before again travelling downwards

Fig. 2.—Horizontal Retort House.

to the foul gas main underground. The lower end of each ascension pipe is fitted with an extension piece, 12 in. in length, which is sealed in a measured quantity of water. The retort valves are placed in the pipes leading from the upper ends of the ascension pipes to the main below ground level. The aim in this design is to remove all pitch by cooling the gas before it reaches the valves. This object has been fully achieved; for trials which have been carried out have proved that there is no deposition of solid matter either in the ascension pipes or any succeeding pipes. Pitch is deposited in a semi-plastic condition in the crosses immediately below the retort mouthpieces, but these deposits are readily removed when the retorts are opened for charging and discharging. Accumulation of pitch and consequent stoppage is thus avoided. The higher boiling fractions of tar condense out in the ascension pipes and flow down into the seal pots; and this steady downward flow ensures the ascension pipes being kept free from solid matter.

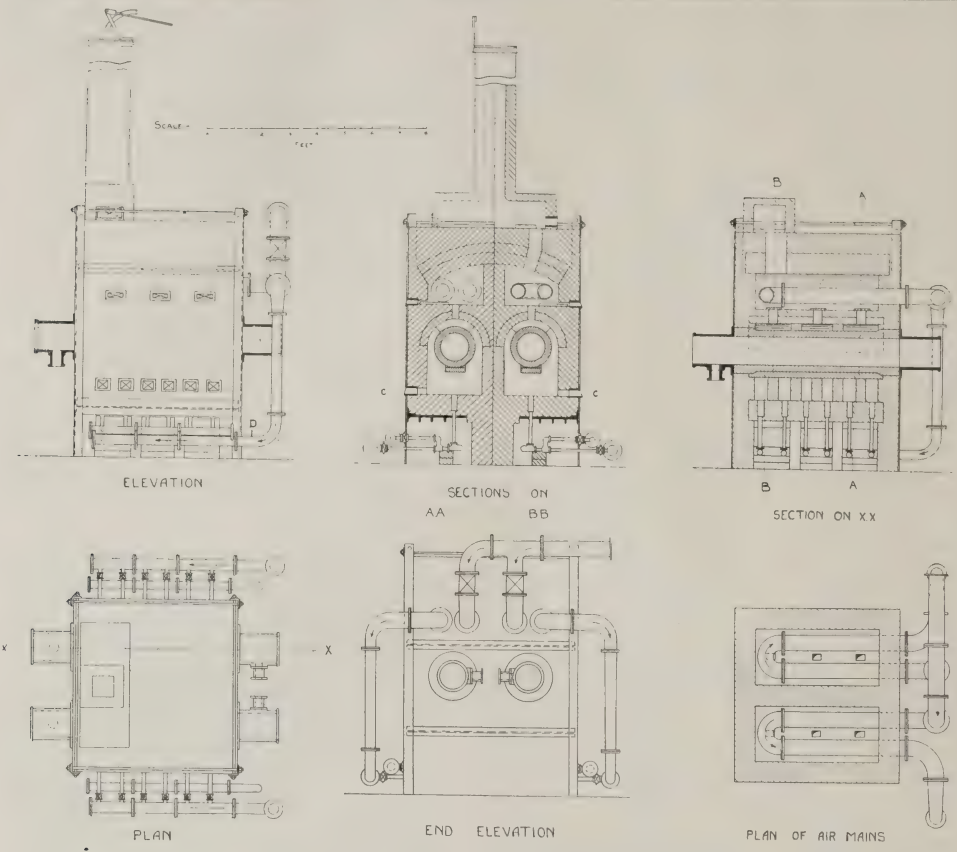


FIG. 3.—HORIZONTAL RETORT SETTING.

The fittings attached to the discharging ends of the retorts and the dispositions of the air supply pipes at this end of the setting are shown in the photograph, Fig. 5, Plate 6, and in several of the diagrams of Fig. 3. The metal castings bolted to the retorts are of the same dimensions as those at the front of the setting, and are fitted with self-sealing doors. Each casting is provided with a short length of 3 in. pipe on the side nearer the middle line of the setting. When normal carbonization tests are in progress, these pipes are closed by means of blank flanges, but if desired the blank flanges may be removed and the retorts connected by means of a short piece. This latter arrangement would prove useful in experiments in which it might be desirable to preheat gases or steam in one retort before passage through a charge undergoing treatment in the second retort; or it might be used for the production of water gas in one retort for passage through a charge in the second retort.

Vertical Retorts.—The vertical retort setting, which is situated in the open yard behind the horizontal retort house, was designed and erected by Messrs. Woodall Duckham, Ltd. The arrangement and method of heating are shown in Figs. 6 and 7, Plates 2 and 3, which give horizontal and vertical sections and elevations. Each retort, which is of silica material, is 8 ft. 7½ in. in length (excluding the coke chamber), and tapered from 8½ in. diameter at the top to 1 ft. 3 in. diameter at the bottom. The coal is fed into the retorts from the small hoppers at the top through close-

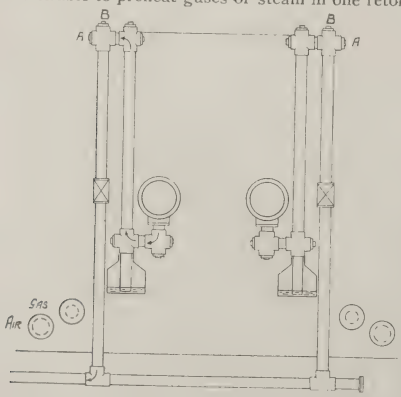


Fig. 4.—Horizontal Retort Setting—Gas Off-Takes.

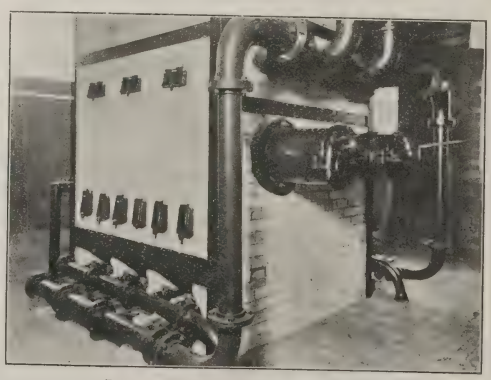


Fig. 5.—Horizontal Setting. Discharging End.

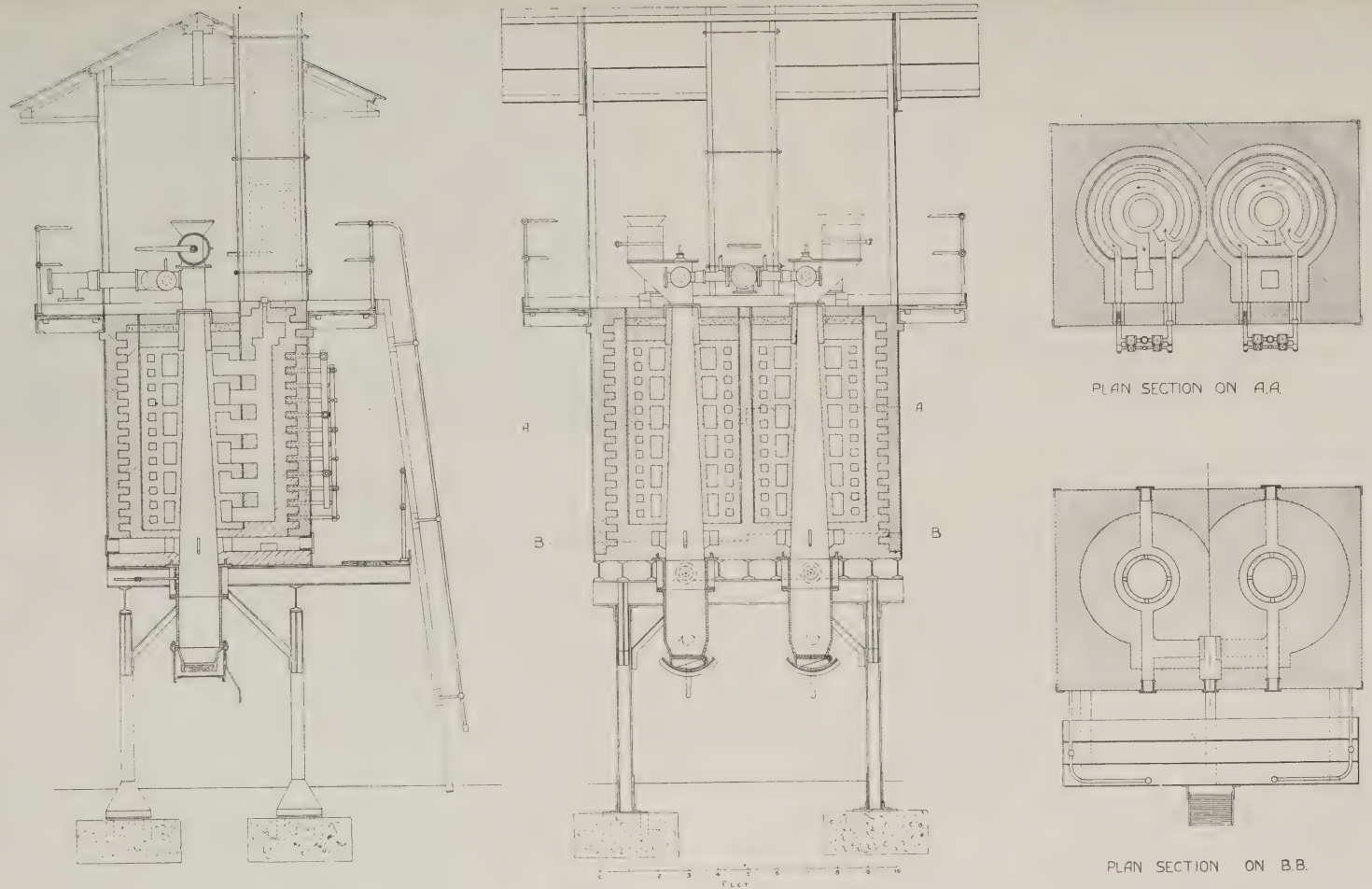


FIG. 6.—VERTICAL RETORT SETTING—SECTIONS.

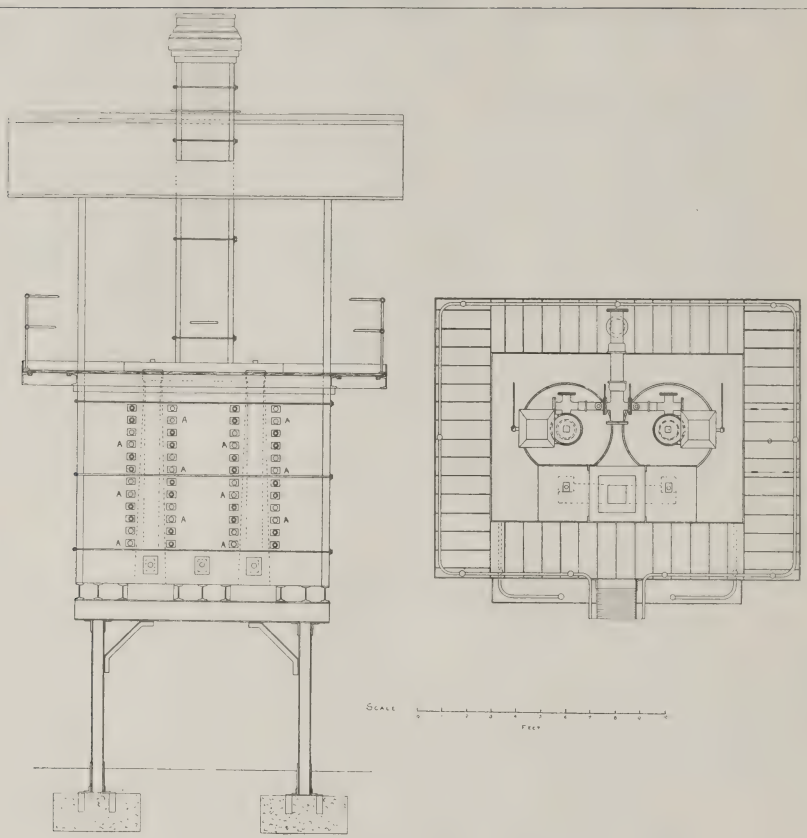


FIG. 7.—VERTICAL RETORT SETTING—ELEVATION AND PLAN.

fitting cylindrical valves. The coal is raised by chain and blocks to the charging platform, which is covered by a galvanized roof. The coke-cooling chambers at the lower ends of the retorts are 1 ft. 4 in. square section, and approximately 3 ft. 6 in. in length. No rotary extractor of the type usually found with continuous vertical retorts is provided; but the charge undergoing treatment rests on a hinged plate situated at the bottom of the cooling chamber. The coke chamber is water sealed in a movable quadrant provided with handle. When the quadrant is moved to one side, the hinged plate falls; and the retort may thus be discharged until the desired quantity of coke has been removed, when the coke chamber is again closed by the rapid movement of the quadrant to its original position.

The setting is heated by coal gas, usually town supply, and the air necessary for combustion is provided by the compressor situated in the exhauster house. The heating chambers for each retort are arranged in six circular horizontal tiers, each tier being under separate controls to enable the temperatures to be adjusted as required through the 6 ft. length of retort exposed to the combustion chambers. The capacity of the heated portion of each retort is approximately 2 cwt. of coal. The air and fuel gas supplied are preheated before mixing, by passage through separate flues surrounding each combustion chamber. The waste gases are collected in vertical flues communicating with a brick chimney which extends to a height of 16 ft. above the charging platform. The arrangement of the various flues is clearly shown in the diagrams of Fig. 6.

The lower end of each retort is provided with four openings which communicate with a common flue with damper adjustment. This enables the two retorts to be connected together at their lower ends, if desired. It is thus possible, as in the horizontal setting, to preheat gases or steam in one retort prior to passage through a charge undergoing treatment in the second retort, or to produce water gas in one retort for passage through a charge in the second retort. Means are provided for taking away the crude gas from either the upper or lower ends of both retorts. In both cases the crude gas passes downwards immediately after leaving the retorts, so that liquid products can be collected without having undergone further decomposition as a result of reflux action back into the retorts.

The air and fuel gas services at the front of the setting are shown in elevation in Fig. 8, Plate 3. A photograph of the front of the vertical retort unit is given in Fig. 9, Plate 6, which includes the charging platform, the burner-control stage, and the pipes supplying fuel gas and air to the setting. Fig. 10 is a view of the discharge end of the retorts.

Air Condenser.—The crude gas from the horizontal or vertical retort setting travels by the 3-in. main A or B (*vide* Fig. 1), situated below ground level, to the air condenser, which may be arranged in circuit or by-passed by suitable manipulation of the three valves provided. The construction of the air condenser and the dispositions of the valves are shown in Fig. 11, Plate 3; and a view of the upper portion may be seen on the left of the photograph, Fig. 9. The condenser is made up of lengths of 3-in. diameter pipe. The total length of air-cooled pipe is 46 ft., so that the cooling area is approximately 36 sq. ft. There are two tar and liquor collecting pots below ground level, the first at the inlet of the air condenser and the second at the outlet. Each pot has an internal diameter of 8 in., and its capacity to the bottom of the gas main is approximately 1·8 gallons. A drain cock is provided in the middle of the condenser, as shown in Fig. 11. When the plant is in operation this drain cock, which is left open, is fitted with an extension piece sealed in a vessel containing a measured quantity of water.

Exhauster and Air Compressor.—From the air condenser the cooled gas travels to an exhauster situated in a small room behind the vertical retort yard. The exhauster, which was supplied and installed by Messrs. Bryan Donkin & Co., Ltd., of Chesterfield, has a rated capacity of 800 c.ft.

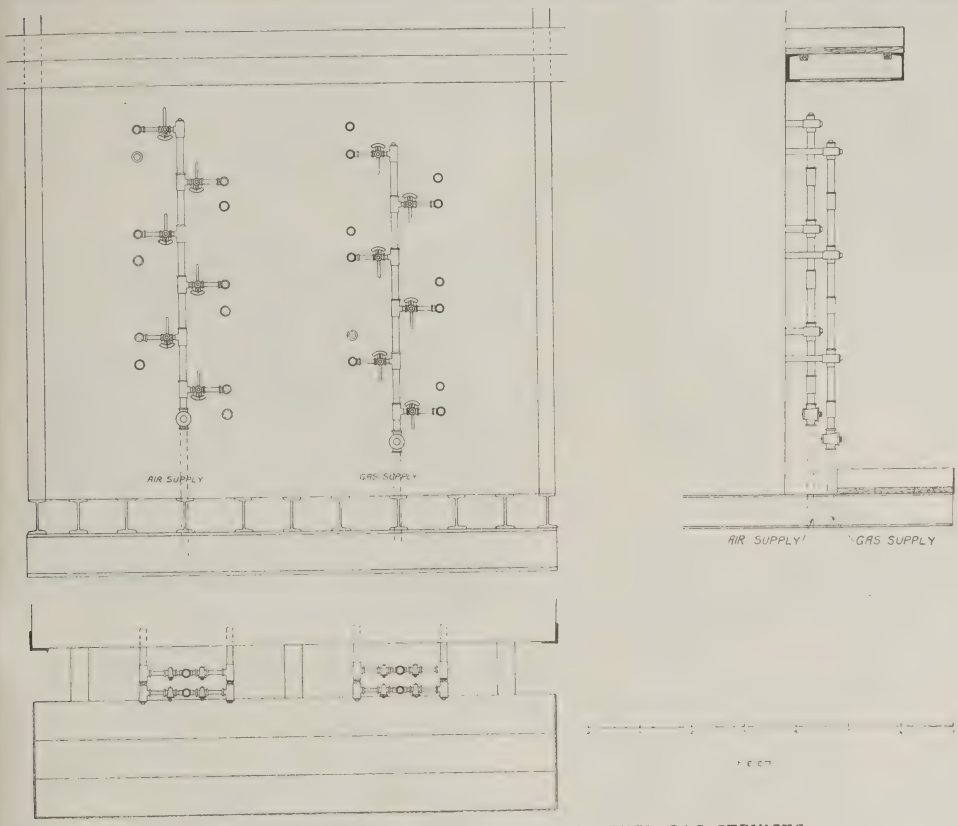


FIG. 8.—VERTICAL RETORT SETTING, AIR AND FUEL GAS SERVICES.

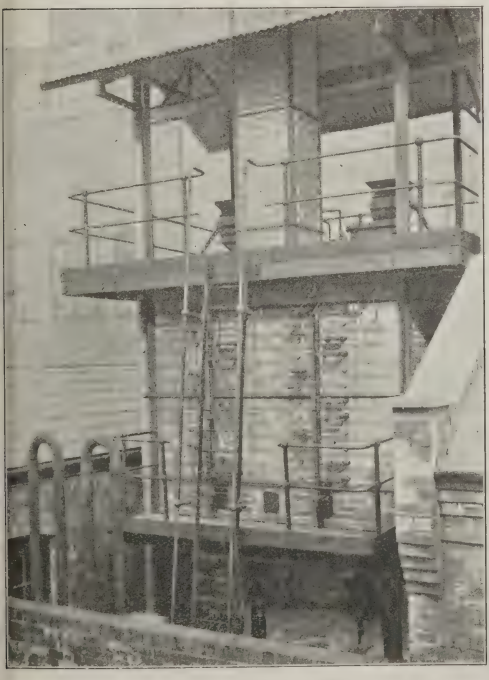


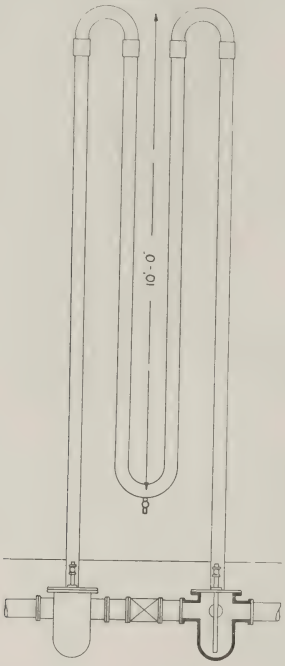
Fig. 9.—Vertical Retort Setting.

of gas per hour at 240 revs. per minute. It is belt-driven from a shaft operated by a 5-H.P. electric motor, the current for which is town supply through a switch with no-volt release. The motor, made by Messrs. Parkinson & Co., of Guiseley, Leeds, is designed to operate with 200 volt two-phase alternating current, 50 cycles per second, and with a shaft speed of 940 revs. per minute. The speeds of the motor and exhauster are not adjustable, but the

Fig. 10.—Vertical Setting, Coke Chambers.

pressure of gas at the inlet to the exhauster is controlled by means of a by-pass governor with balanced bell and conical valve.

The air required for heating the two retort settings is provided by a compressor which is also situated in the exhauster house, and was supplied and installed by Messrs. Bryan Donkin, Ltd. The compressor is belt-driven from



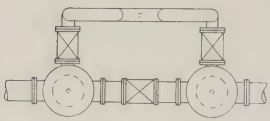
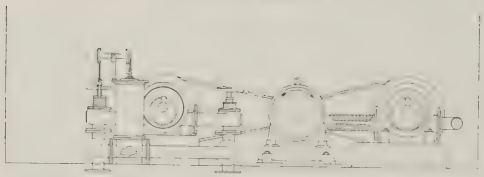


Fig. 11.—Air Condenser.



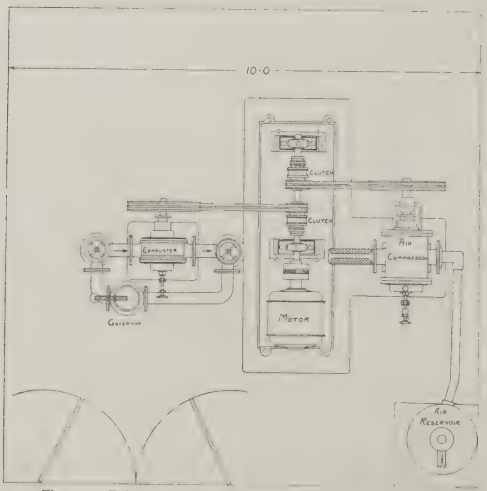


Fig. 12.—Exhaustor and Compressor—Plan and Elevation.

the motor shaft, and has a rated capacity of 4000 c.ft. per hour at a speed of 255 revs. per minute. From the compressor the air enters a reservoir placed in one corner of the exhauster house, and provided with weighted escape valve at the top and a mercury gauge to enable the pressure to be regulated to the required amount.

The exhauster and compressor are put in or out of gear by means of separate Hele-Shaw patent friction clutches.

The arrangement of the plant in the exhauster house is shown in plan and elevation in Fig. 12, Plate 3, and a photograph is given in Fig. 13, Plate 6.

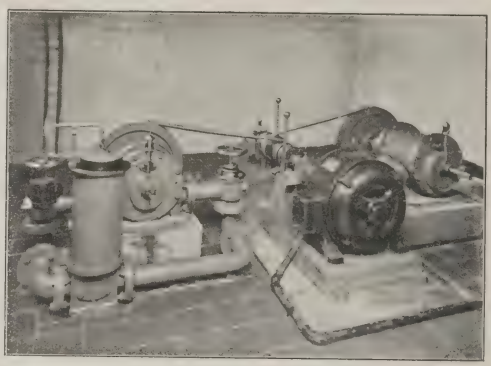


Fig. 13.—Exhauster and Air Compressor.

Scrubbers.—After leaving the exhauster, the gas is conveyed to two tower scrubbers erected by Messrs. Clayton, Son & Co., Ltd., of Leeds. A collecting pot is placed at position E, Fig. 1, in the service connecting the exhauster with the scrubbers. Both scrubbers are packed for a depth of about 5 ft. with porcelain rings supplied by Messrs. J. Macintyre & Co., of Burslem. Each ring is 1 in. external diameter and 1 in. depth, and the thickness of the porcelain is 1-10 in. The scrubbers, which are shown in elevation and section in Fig. 14, Plate 4, are 10 ft. high and 3 ft. internal diameter, and are fitted with water supply pipes and perforated plate water distributors at the top. The internal capacity of each scrubber, making due allowance for the volume occupied by the porcelain rings, is approximately 60 c.ft. The valves and connections are so arranged that either scrubber may be used alone, or the two in series, or both may be cut out of circuit.

Purifier.—The oxide purifier adjacent to the scrubbers (*vide* Fig. 14) consists of a box 4 ft. square and 4 ft. deep. The top cover is made gas-tight by means of rubber jointing material. The purifier contains three wooden grids, so that the purifying area is 48 sq.ft.; the internal volume, allowing for the space occupied by the oxide, is approximately 50 c.ft. A view of the scrubbers, purifier, and wall crane is given in the photograph, Fig. 15, Plate 6.

Meter.—The purified gas is measured in a 100-light wet meter supplied by Messrs. Parkinson & Cowan, Ltd. The meter, which is situated in the small laboratory adjoining the exhauster house (*vide* Fig. 1), contains a Warner and Cowan drum designed to compensate for any change in water level.

Holders.—From the meter the gas is led to one or other of two gasholders, occupying the positions shown in the plan, Fig. 1. Each holder consists of one column-guided lift of 1100 c.ft. capacity and a steel tank above ground level. The construction of the holders is shown by the diagrams in section and elevation in Fig. 16, Plate 4. Indicators are provided to enable the rise or fall of each holder to be conveniently measured at any time. The volume of the crown of each holder is 34 c.ft., and the capacity per inch rise is 9·25 c.ft. The pressure thrown by the bell is approximately 4·5 in. water gauge, and the volume above the water line when the bell is in its lowest position is about 120 c.ft.

Boiler and Steam Supply.—Provision is made for experiments on steaming, if these should be required. The steam is raised by means of a small Kirke gas-fired boiler, supplied by Messrs. Spencer Bonecourt, Ltd. This boiler, which appears in the photograph, Fig. 10, and is shown in section and elevation in Fig. 17, Plate 4, is designed to

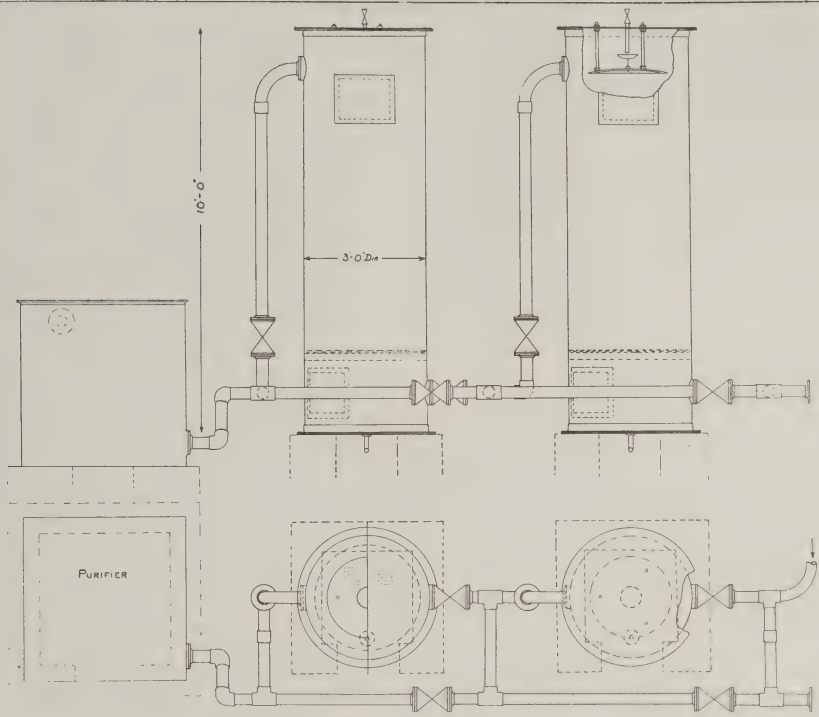


FIG. 14.—SCRUBBERS AND PURIFIER.

raise steam at a pressure of 120 lbs. per sq. inch. The water is fed into the boiler by means of a half-inch Simplex injector. From trials which have been made, it has been found that, with the maximum gas supply as at present arranged, the boiler raises approximately 50 lbs. of steam per hour at 100 lbs. pressure from water at ordinary temperature; the consumption of gas of a gross calorific value of 470 B.Th.U. per c.ft. is about 180 c.ft. per hour.

The services from the boiler are so arranged that steam may be admitted to the vertical retorts at either the upper

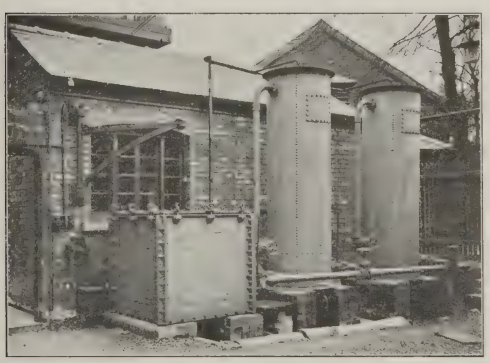


Fig. 15.—Scrubbers and Purifiers.

or the lower ends. In addition, steam may be supplied to the gasholder tanks through injectors which ensure the circulation of water. This apparatus has been installed to prevent the freezing of the water in the tanks during cold weather.

Measurements and Weighings.

Coal and Coke.—The coal supplied to the retorts is weighed in covered galvanized receptacles, on a portable platform machine supplied by Messrs. W. & T. Avery, Ltd. The beam of the machine is graduated in two scales to a maximum of 500 lbs. One division on the scale cor-

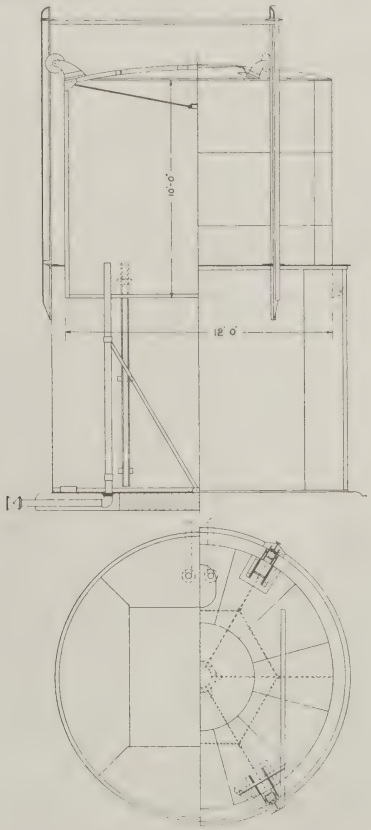


Fig. 16.—Gasholder.

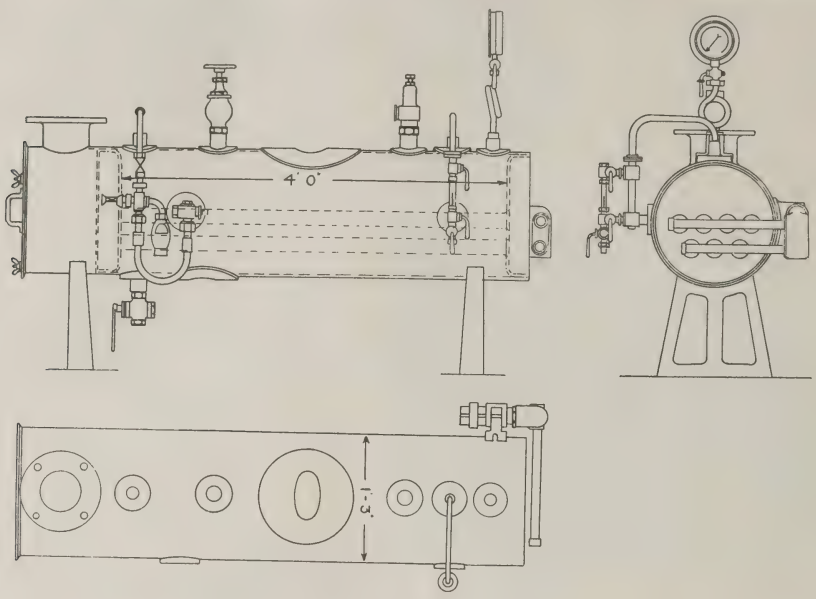


FIG. 17.—GAS FIRED BOILER.

responding with the main poise represents 25 lbs. and one division on the secondary scale represents 4 ozs. Each galvanized receptacle has a capacity of about 130 lbs. of coal, and since the machine responds to the nearest ¼-lb. the accuracy of the weighing is within 0·2 p.ct. The coke made is also weighed in similar receptacles on the same machine.

Tar and Liquor.—The amounts of tar and liquor, which separate out in the several pots situated between the retorts and the scrubbers, are transferred to covered galvanized tanks reserved for the purpose. Each tank, which has a total capacity of approximately 25 gallons, is provided with a drain cock at the bottom. After standing for some time, the tar and liquor are separated from one another and weighed in previously tared tanks. The amounts of tar and liquor are determined by weight, allowances being made for the known weights of water initially placed in the seal pot in the middle of the air condenser and in the pots in front of the horizontal retort setting. The volumes of tar and liquor are afterwards calculated from determined specific gravities.

Pitch.—In the case of the horizontal retort setting, the amounts of pitch removed from the crosses below the mouthpieces are collected and weighed at the end of the test.

Gas.—The make of purified gas is measured by the wet meter situated in the small laboratory adjoining the exhauster house. As a general practice readings, together with temperatures and pressures, are taken every hour; but on occasions readings are taken more frequently for the purpose of following the variations in the rates of gas evolution as carbonization proceeds. The meter is calibrated before and after each test. The make of purified gas as recorded by the meter is corrected for the amounts used for test purposes and taken at points prior to the meter.

Fuel to Heat Retorts.—The amount of fuel gas required to maintain the retorts at the desired temperatures is ascertained from periodic readings of the town-gas supply meter.

SAMPLING.

Coal and Coke.—The coal to be carbonized is sampled by placing a definite amount in a sample bin as each galvanized receptacle is filled for weighing. The amounts taken are then mixed, broken up into smaller pieces, and quartered down. The operations of crushing and quartering are continued until the sample has been reduced in amount to about 1 lb. The small sample is afterwards ground to a fine powder and used for the purpose of proximate and ultimate analyses and the determination of calorific values. The method of sampling the coke made is similar to that adopted for coal.

Tar and Liquor.—The tar and liquor, after separation from one another, are sampled from the 25-gallon tanks into which they are placed at the end of the test.

Pitch.—The quantities of pitch removed from the gas off-takes of the horizontal retorts are collected together, crushed, and quartered down. The operations of crushing and quartering are continued until the amount is reduced to about 1 lb.

Gas.—The outlet pipes of the two 1100 c.ft. holders are provided with plug cocks at positions K and L, Fig. 1, and with wheel valves at positions M and N. From a point between the plug cock K and the valve M of holder No. 1, a 1-in. gas service is taken and made to pass between the laboratory and the purifier, and thence to position P, where it is provided with a cock and a vertical pipe projecting about 4 ft. above ground level. A similar service from between L and N of holder No. 2 travels first behind the purifier and then to point Q. From both services branches are led into the laboratory. When holder No. 1 has been filled and the inlet and outlet valves have been closed, the holder is allowed to stand for several hours to enable the gas to become uniform in composition. The valve M and the cock P are then opened and gas is allowed to burn at the end of the vertical pipe at P. Meanwhile, calorific value and specific gravity determinations are made in the laboratory and samples are taken for purposes of analysis in an Orsat apparatus and in a Bone and Wheeler gas machine. The specific gravities are ordinarily determined in a Schilling's apparatus, and the calorific values in a Junker calorimeter as modified by the Birmingham Gas Department. The laboratory equipment also includes a Beasley recording calorimeter, which is used on occasions to record the calorific values of the gas leaving the holders. The method of examination of the gas from the second holder is similar to that described for the first holder.

The Beasley calorimeter is generally employed for the purpose of recording the calorific value of the gas made, as it travels from the purifier to the meter, a test service being run into the laboratory from the outlet of the purifier. Branches from this same service supply a Referee's sulphur apparatus, and provide the gas necessary for lead acetate paper tests.

The samples required for determinations of the amounts of sulphuretted hydrogen in the crude gas are taken from services connected to the gas main between the second scrubber and the purifier. These services are also used for long-period tests for naphthalene and ammonia.

Fuel to Heat Settings.—A branch service from the town gas meter to the laboratory enables tests to be made on the gas used to heat the retorts. Samples of the waste gases leaving the settings are drawn through silica tubes cemented into the brickwork at the bases of the chimneys.

Measurements of Temperatures and Pressures.

Horizontal Retorts.—The heating of the horizontal retorts is controlled by systematic measurements of the temperatures of the silica bricks situated above the burners. The silica bricks are sighted through the openings drilled in the inspection doors C, Fig. 3, and the temperatures are determined by means of a Cambridge optical pyrometer.

The temperatures of the charges at different points within the retorts are also taken on occasions. For this purpose four holes have been drilled and tapped in each of the self-sealing doors at the ends of the retorts. Iron tubes closed at one end are passed through these openings into the charges, and thermo-couples are placed in the tubes. The leads of the thermo-couples are insulated from one another by silica tubing. When the pyrometers are not in use, the holes in the retort doors are closed by metal plugs.

The temperatures of the air preheaters are measured by thermo-couples passed through the damper doors of the horizontal waste-gas flues. Pyrometers are also placed at positions D, Fig. 3, in the air mains between the preheaters and the burners.

The temperatures of the crude gas leaving the retorts are measured by thermo-couples placed in the top of the ascension pipes at points A of Fig. 4.

For the purpose of measuring the pressures at the top of the ascension pipes, connections are run from positions B (Fig. 4) to an inclined gauge so constructed that a movement of 1 in. represents $\frac{1}{10}$ in. water gauge.

Vertical Retorts.—The temperatures of the combustion chambers surrounding the vertical retorts may be determined by optical pyrometer sighted through the openings A of Fig. 7. These openings are ordinarily closed by conical brick plugs which can readily be removed. The temperatures of the products leaving the retorts may be measured by thermo-couples inserted in the gas off-takes.

Air Condensers, Scrubbers, &c.—The temperatures of the gas made are measured by mercury thermometers placed at the following points: (1) Inlet and outlet air condenser, (2) inlet and outlet exhauster, (3) inlet scrubber No. 1, (4) inlet scrubber No. 2, (5) inlet purifier, (6) inlet meter, and (7) outlet meter. The temperature of the air entering the compressor is also determined by a mercury thermometer.

Gas pressures are measured by means of a battery of vertical water gauges situated in the laboratory, to which connections are run from the following points: (1) inlet and outlet air condenser, (2) inlet scrubber No. 2, (3) inlet purifier, and (4) inlet meter. A vertical water gauge in the exhauster house registers the pressure at the outlet of the exhauster; and from a similar gauge outside the laboratory the pressure at the outlet of the meter may be measured. The pressure at the inlet exhauster is determined by an inclined gauge situated in the exhauster house, and the pressure at the outlet of the air compressor is registered by a mercury gauge.

Horizontal Setting, Preliminary Experiments.

Table I.—*Analyses of Coal Used. Percentages by Weight.*

Proximate Analysis (as Charged).		Ultimate Analysis (Dry Sample).	
Moisture	5·0	Ash	8·6
Volatile matter	33·0	Carbon	73·3
Fixed carbon	53·8	Hydrogen	4·8
Ash	8·2	Sulphur	2·3
		Nitrogen	1·7
		Oxygen	9·3
	100·0		100·0

Calorific value (gross) of dry coal, B.Th.U. per lb., 13,380.

When the retorts had been heated to about 500° C., they were filled with coke. The temperature of the setting was then slowly raised and every effort was made to obtain the maximum possible length of each retort at a uniform temperature. The maximum length which could be kept at a uniform temperature was about 4 ft., that is, within 1 ft. of the ends of the retorts. This maximum length was secured by heating the end combustion chambers to temperatures higher than those of the intermediate chambers, in order to allow for the losses of heat from the end walls of the setting. At temperatures of approximately 1100° C. the end combustion chambers were raised about 60° C. higher than the intermediate chambers.

When the desired temperature conditions of the retorts had been attained, the coke was discharged, and an iron stop was inserted in the discharge end of each retort. The iron stop consisted of a form of pusher with a circular plate of 10 in. diameter and a handle bent to rest on the end cast-

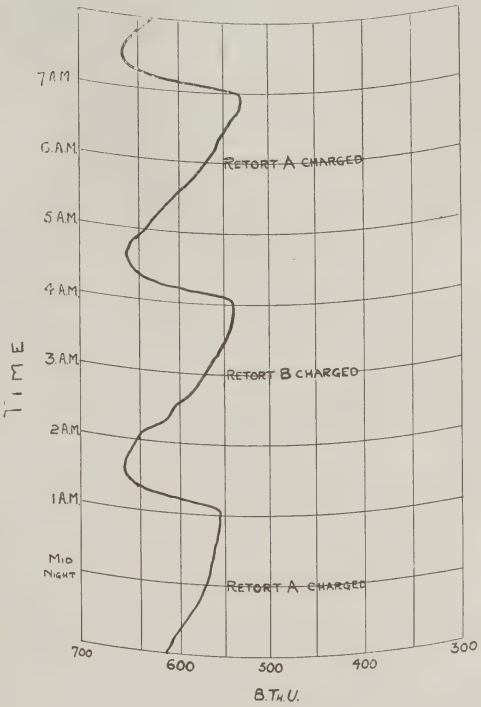


Fig. 18.—Calorimeter Chart.

ing of the retort. The stop was held in position when the discharging door was closed. The handle was about 2 ft. 3 in. in length, so that the stop occupied a position about 9 in. from the outside wall of the setting. The iron stop was removed each time the retort was discharged.

The coal, which had previously been broken to the desired size (maximum about 2 in.), was charged by hand until it occupied the portion of the retort at a uniform temperature. During this operation the charge was rammed several times, and the coal was prevented from dropping into the gas off-take pipe by means of a piece of sheet metal

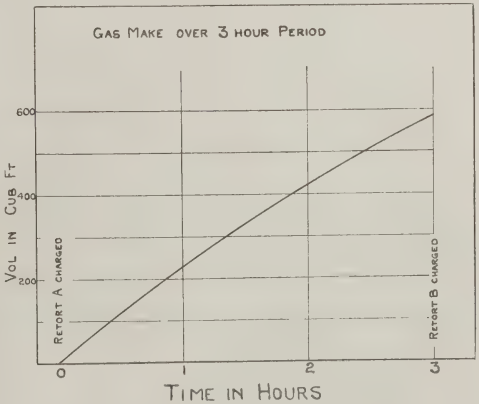


Fig. 19.

bent to fit the lower half of the retort mouthpiece. When the retort had been charged, the piece of sheet metal was removed and the door was closed.

The first trials were made with the object of determining the time required for carbonization with the combustion chambers at about 1150° C. Different charges were heated for periods varying from five to nine hours, and as a result it was concluded that the six-hour period produced a coke reasonably low in volatile matter. It was then decided to conduct trials in which the amounts of coal used and the products obtained were determined, and in which the proposed methods of operation could be tested.

Experimental Results.—The principal results obtained with the two horizontal retorts are given in Table II. Each retort was charged with approximately 124 lbs. of coal every six hours; and at the same time the pitch, which had collected in the off-take pipes below the mouthpiece, was removed. The operations of discharging, removal of pitch, and charging occupied from 10 to 15 minutes; the time occupied solely in charging was about 5 minutes. The two retorts, designated A and B, were charged alternately every three hours.

The amount of dry coke made was 13·3 cwt. per ton of coal, with a moisture content of 5 p.ct.; the coke contained 3·8 p.ct. volatile matter. The yield of gas of an average gross calorific of 603 B.Th.U. per c.ft. was 10,448 c.ft., which is equivalent to 63 therms per ton of coal. The amount of dry tar collected per ton of coal was 12 gallons, and the corresponding quantity of pitch removed from the gas off-takes was 16 lbs. The ammonia liquor recovered was equivalent to 23 lbs. of ammonium sulphate per ton of coal carbonized.

Since the horizontal setting contains only two retorts, the gas evolved varied greatly in quality during the progress of carbonization. The nature of the variations in calorific value is well brought out in Fig. 18, Plate 5, which is a copy of a typical portion of the chart taken from the recording calorimeter. This calorimeter was supplied with gas from a connection between the purifier and the meter. The variations shown by the chart are probably smaller than the actual variations in the quality of the gas as it passed through the foul main, owing to the mixing which must have occurred in the scrubbers and purifier. From Fig. 18 it may be seen that retort A was charged at about midnight; the door was closed at 12.14 a.m. As a result of the time required for the gas to reach the purifier and the lag of the calorimeter, the rich gas evolved from the charge did not commence to affect the chart until 1 a.m., when the recorded calorific value began to rise from a minimum of 555 B.Th.U. per c.ft. The calorific value then increased rapidly to a maximum of 670 B.Th.U. at 1.30 a.m., after which it fell more slowly to a minimum of 540 B.Th.U. at 4 a.m. At this point the rich gas first evolved from the new charge put into retort B at 3 a.m. had reached the calorimeter, with the result that the curve began to rise again.

TABLE II.—*Trial Test of Horizontal Retorts.*

Duration of test, hours	72
Coal carbonized, weight in lbs.	2,991
Coal carbonized per retort per day, lbs.	498
Duration of carbonization of each charge, hrs.	6
Weight of charge, average in lbs.	124
Coke (dry) made, cwts. per ton of coal	13·3
Volatile matter in coke, p.ct.	3·8
Gas per ton of coal, c.ft. at 60° Fahr. and 30 ins. saturated	10,448
Composition of gas, volume p.ct.:	
CO_2	2·6
C_mH_n	4·6
O_2	0·2
CO	10·8
H_2	46·7
CH_4	29·8
N_2	5·3
	100·0
Inerts (excluding oxygen), p.ct.	7·9
Calorific value of gas, B.Th.U. gross per c.ft.	603
" " " " net per c.ft.	543
Thermal value of gas, therms gross per ton coal	63·0
" " " " net per ton coal	56·7
Specific gravity of gas (air = 1)	0·46
Gas made per retort per day (60° Fahr. 30 ins. saturated), c.ft.	2325
Tar (dry), gallons per ton of coal	12·0
Ammoniacal liquor, gallons of 10 oz. per ton of coal	27·3
Ammonium sulphate (pure) equivalent per ton, lbs.	23·0
Sulphuretted hydrogen, grains per 100 c.ft. at inlet purifier	600
Sulphuretted hydrogen, volume p.ct.	1·0
Ammonia, grains per 100 c.ft. at inlet purifier	0·3
Naphthalene, grains per 100 c.ft. at inlet purifier	0·7
Sulphur in purified gas, grains per 100 c.ft.	20·6

The rate at which gas was given off during a three-hour period from the charging of retort A to the charging of retort B is shown by the curve, Fig. 19. In this curve the total volume of gas evolved is plotted against time for a typical period of three hours. During the first hour the volume of gas was 230 c.ft., and at the end of the second hour the volume had increased to 425 c.ft., so that the amount for the second hour was 195 c.ft. During the third hour the volume collected was 160 c.ft. The curve thus illustrates the reduction in the rate of gas evolution as carbonization proceeded.

The average temperatures of the combustion chambers, as measured by means of a Cambridge optical pyrometer, are given in Table III. The combustion chambers for each

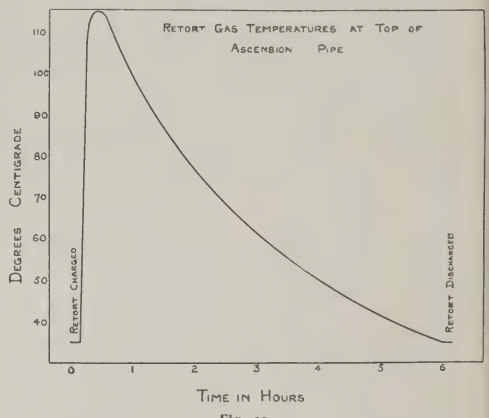


Fig. 20.

retort are numbered from the front or charging end to the discharging end of the setting. The temperatures of the end chambers, Nos. 1 and 6, averaged 1220° C., and the average of the middle chambers was 1150° C. The temperature of the air preheater in the horizontal waste-gas flues ranged between 700° and 800° C.

TABLE III.—*Temperatures of Retort Setting in Degrees Centigrade.*

Combustion Chamber.	Retort A.	Retort B.
No. 1	1210	1235
2	1137	1148
3	1157	1130
4	1153	1190
5	1168	1143
6	1215	1226

The averages of the temperatures and pressures of the gas and air as measured at different points of the plant are given in Table IV. The retorts were operated as nearly as possible at level gauge. The temperatures recorded at the outlet of the air condenser and at all succeeding points

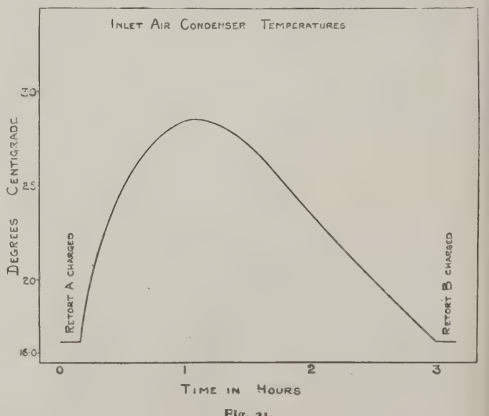


Fig. 21.

Fig. 22.

did not deviate greatly from the averages given in the table; and the variations which did occur were due mainly to changes in atmospheric conditions. The temperatures taken in the ascension pipes and at the inlet to the air condenser, however, varied as the carbonization of the charge in each retort progressed. Several series or readings, taken every five minutes during several hours, of the temperatures of the retort gases, as they travelled through the ascension pipes, were made. From these series, the curve given in Fig. 20 has been drawn by plotting temperatures in degrees Centigrade against time in hours. It may be seen from this curve that when the retort had been closed the temperature rose almost at once from 35° C. to a maximum of 115° C. The temperature then fell gradually until it again reached 35° C. at the end of the sixth hour, when the retort was due for discharging.

The temperatures of the gas at the inlet to the air condenser exhibited a three-hour cycle of changes, since the gases from both retorts passed this point of measurement and a charging operation took place every three hours. The nature of the temperature changes is shown in the curve, Fig. 21. When the first retort had been closed after being charged with coal, the temperature rose from 16·5° C. to a maximum of 28·5° C. at the end of one hour, after which there was a gradual diminution in temperature to a minimum of 16·5° C. when the second retort was opened for charging.

The temperature at the outlet of the air condenser averaged 6° C. (43° F.), so that the condenser is clearly of ample capacity.

Table IV.—*Temperatures and Pressures.*

Position of Measurement.	Temperature ° C.	Pressure. Inches Water.
Air to burners of retort A, position D, Fig. 3	210	..
Air to burners of retort B, position D, Fig. 3	290	..
Air compressor	12	27·9
Gas made—		
Ascension pipe, retort A, position A, Fig. 5	75	*Nil*
Ascension pipe, retort B, position A, Fig. 5	75	*Nil*
Air condenser, inlet	24	*Nil*
,, ,, outlet	6	*Nil*
Exhauster, inlet	13	−0·1
,, outlet	16	4·8
Scrubber No. 1, inlet	6	..
,, No. 2, inlet	6	4·8
Purifier, inlet	6	4·8
,, outlet	6	4·7
Meter, outlet	11	4·6

APPENDIX.

The Preparation of Coke Sections.

The examination of a lump of coke with the object of determining its texture is normally a difficult matter, if it be desired to obtain an idea as to the size and shape of the pores, the wall thickness, and the general condition of the specimen. Micro-sections, as ordinarily examined by transmitted light, are usually much too small, and it is necessary to examine a number of sections to obtain information as to the structural differences existing in different parts of one piece of coke. For this reason, hand sections are also examined, but in these sections the shaded air pores do not show up well against the coke skeleton.

With these defects in mind, Dr. Rose, of the Koppers Company, has developed an ingenious method for revealing the structure of the coke, and for the details of the method we are indebted to Dr. E. W. Smith, of the Woodall-Duckham Companies. Essentially, the method consists in filling in the pores and cracks of a plane section with a suitable white cement and polishing the surface so obtained. The cement used is mainly plaster of paris with a proportion of admixed magnesia. The method has been tried by the Staff of the Research Committee for the preparation of sections of the coke made in the horizontal retorts of the experimental gas plant; and full-size photographs of two of the sections are reproduced in Figs. 22 and 23, Plate 6. From these photographs it may be seen that the cell walls of the coke are rendered easily visible against a strongly contrasting background, and that inert materials such as shale are clearly brought out.

Attention is drawn to this method of preparation of coke sections, since it is believed that it will prove valuable

Fig. 23.

in investigations in which comparison of the structure of coke made from different coals and by different methods is desirable. The preparation of micro-photographs of portions of the sections set in plaster of paris is at present in progress.

Prof. COBB, in introducing it, said: With reference to the Fourteenth Report, for convenience it is classified in that way as a report, but when you see it, you will notice that it is really rather a record interesting, we believe, to the Institution of Gas Engineers than an actual report upon the detail of scientific work. It consists essentially of a description of the experimental plant erected by the kindness of Mr. Henry Woodall, with some friends who wished to be associated with him, at the University of Leeds, as a memorial to his father, the late Sir Corbet Woodall; the description to serve as a record in the "Transactions" of the Institution of Gas Engineers of this valuable addition to the equipment of the Department of Coal Gas and Fuel Industries of the University. During the year Dr. Parker has been engaged in trying-out different portions of the plant, and making such adjustments in it as were necessary to fit it for use not only for demonstration purposes, but for the solution of the specific problems of the gas industry. As always happens in the case of a new plant of this sort—which of necessity departs in so many respects from standard practice in order to meet special needs—the time and labour required in getting it into operation have been considerable, in spite of the care bestowed upon it by its skilled and experienced designers. The Committee are greatly indebted to Dr. Parker for the work that he has been expending upon it, and hope to begin gathering the harvest in the near future.

Dr. A. PARKER said: In September, 1917, Mr. Henry Woodall made the generous offer to erect and present to the University of Leeds an experimental plant in memory of his father, the late Sir Corbet Woodall. This offer was gratefully accepted; but the conditions prevailing at that time prevented the carrying out of the project. When circumstances became more favourable, Mr. Henry Woodall commenced operations, and the plant was officially presented to the University at the opening ceremony held on March 26 last year.

The original idea that the memorial might take the form of an experimental plant was due to Mr. W. T. Dunn. In the first instance, the suggestion was to erect one setting of retorts; but so many friends of the late Sir Corbet Woodall expressed a desire to help, that the scheme grew until finally two settings, including both horizontal and vertical retorts, were installed. Mr. J. F. Scott, after consultation with Prof. Cobb, designed the general lay-out of the installation to meet the requirements of the site available and the units proposed.

The first utilization of the plant has been made by the Gas Investigation Committee. We commenced operations last year, when the work on the waste-heat boilers attached to the vertical retort settings at Windsor Street, Birmingham, had been completed. In the first place the many smaller fittings necessary in an installation intended not only for demonstration purposes, but also for the investigation of definite problems, were added. Gas making and carbonization trials on the horizontal retorts were then carried out; and at the same time the performance of the condensing, scrubbing, purifying apparatus, &c., was examined.

It must be emphasized that the installation is not in any way a small-scale model of a gas-works, but contains many features which differ from usual practice. It was therefore necessary that preliminary trials should be conducted before a definite research programme could be commenced. The preliminary trials of the horizontal setting and of the condensing and purifying apparatus, &c., have been completed; and certain alterations have been made. As a result of these tests and alterations, the suitability of the horizontal setting and auxiliary plant as a carbonization unit has been established. Tests of the vertical retort setting are now practically complete, and it is hoped we shall be able to embark on a definite research programme almost immediately.

The Fourteenth Report is a description of the experimental plant as it now stands; and, as Prof. Cobb has already stated, the description is given at this stage to serve as a record in the Transactions of the Institution of Gas Engineers.

As an appendix to the report a brief description is given of a method of preparation of coke sections as devised by Dr. Rose, of America, and brought to our notice by Dr. E. W. Smith. Attention is drawn to this method, since it is believed that it will prove useful in investigations in which comparison of the structure of coke made from different coals and by different methods is desirable. One section prepared as described has been brought along for inspection by those members who may be interested.

Mr. THOMAS GLOVER (Norwich): I do not wish to detain the meeting, but, as a member of the Investigation Committee who has taken an interest in this investigation from the earliest days, I am bound to say that I feel a little puzzled as to the definite research programme which we have in view at the present time. I hope that any members, outside the Investigation Committee, who have ideas will be kind enough to communicate them to us for our guidance and for our investigation.

Dr. Parker's précis of the report on the investigation of coke opens up, I think, rather a promising field. Coke at the present moment is a subject of very great importance to gas engineers, as at its best it forms such a large credit to the coal account. At the present moment we are face to face with considerable competition from the coke-oven people, who are grading their coke and entering into competition with gas coke, and are upsetting our market. I think we cannot do amiss by pursuing this investigation on coke, especially if it can be directed through practical channels which will help the industry to market its coke—after having produced the right type—and keep up the price as much as possible, and so keep up that credit to the coal account which has been so important in the past. I understand from an old student of the Institution who has been out doing important work in connection with vertical retorts in Boston and other places in the United States that this investigation on coke is an important matter at the Technical College in Boston, and that it is not always the best thing to place the coke in plaster of Paris. It is better to investigate the cavities in the coke by some addition to the microscope which helps to show-up the grain and structure and texture of the coke better than can be seen by the microscope alone or by the naked eye. All the same, we are interested in the specimens which Dr. Parker has exhibited. I had the curiosity to send Prof. Cobb some pieces from my works which I thought were better than those he showed me on the Investigation Committee. I do not know what is the position yet with regard to those samples, but I shall be glad to see them when they are ready for demonstration. Again, I would reiterate that the Committee would like ideas from the members of the Institution for the future work of this Investigation Committee.

Dr. R. LESSING: The last remark on coke by Mr. Glover encourages me to remind the members of the Institution that a similar method of dealing with coke samples was incorporated in a paper which I had the privilege of reading before the Institution thirteen years ago. An almost identical method for showing-up the structure of coke was then used; the only difference being that I employed then, and still do, wax of high melting-point to obtain the same effect. While specimens so prepared might not look so effective from a distance as the plaster of Paris ones do, they have the advantage that the wax can be easily removed by melting. Then we know the composition, and can study the coke under the microscope or by any other means, and analyze it as before. The specimens prepared in connection with my paper thirteen years ago were shown in some very fine photographs which are incorporated in the Transactions for that year. I should like to emphasize the point made by Mr. Glover that the study of the coke, and, obviously, of the processes by which the coke is made, and incidentally some gas, is of the greatest possible importance, and may actually mean a turning-point in our methods of carbonizing—at any rate in the methods of preparing the coal for carbonization. I have not the slightest doubt that these investigations will lead to results which will involve vital alterations in the processes to which we have hitherto been accustomed.

The PRESIDENT: I understand that there is shortly to be a meeting of the Investigation Committee; and I am certain that the Committee will be only too pleased to receive suggestions from any member of the Institution bearing on the work in view. I will ask Prof. Cobb to say a word.

Prof. COBB: I can only endorse all that Mr. Glover has said. The Committee are always willing to receive suggestions as to what lines of investigation are best calculated to develop the gas industry, and also on the subject of carbonization, which is the basis of the gas industry. I also endorse what Mr. Glover said about studying the structure of the coke. This is a suggestion which presents itself as being particularly suitable for our investigations, and it is one with which I entirely agree. As Mr. Glover knows, this is a subject which is coming up for discussion in more detail by the Investigation Committee tomorrow. Dr. Lessing's remarks confirm the importance of the subject, if any confirmation were needed. He also put forward, I will not say a claim, but something in the nature of a claim to have anticipated this method of preparation. Of course, Dr. Lessing knows perfectly well that not only with coke, but with other things, the impregnation of a porous substance with wax and other media for filling-up the pores is not a thing upon which one could take out a valid patent at the present day. It is simply that this method is very convenient, and it does give—as some of you may be interested in seeing, if you have not already seen it—a very vivid contrast, and makes a striking demonstration to the eye of the structure of a coke. I think you may be interested in seeing it, and I think this method, or this method modified as we may find necessary for the investigation of the finer pores, and so on, will prove exceedingly useful not only in our investigations, but in the investigations which may be undertaken by other members of the Institution. It was for this reason that, without being able to claim anything in the way of originality in connection with it—because it was brought to our notice by Dr. Smith—we thought it advisable to show one or two of these prepared specimens. I beg to move the adoption of the report.

The PRESIDENT: I have very great pleasure in seconding the motion.

The report was adopted.

NOTES ON THE TANKLESS GASHOLDER AT THE ETABLISSEMENTS ARBEL, DOUAI, FRANCE.

By L. ROLLAND d'ESTAPE, Ingénieur E.C.P.,
President of the Société Technique de l'Industrie du Gaz en France, and Hon. Member of the Institution of Gas Engineers.

The idea of eliminating from gasholder design the tank and the large volume of water contained therein, and substituting for them simply a vertical cylinder having a fixed base and an upper platform rising and falling in the cylinder, is not new. The difficulty of devising a gas-tight form of packing, either dry or wet, between the cylinder and the moving platform, had for long been the sole obstacle in the way of gasholder builders, until the problem was first solved in Germany, notably by the Maschinenfabrik Augsburg-Nürnberg, who have constructed a number of these tankless holders up to a capacity of 120,000 c.m. (nearly $4\frac{1}{4}$ million c.ft.).

The tankless gasholder at the Arbel Works at Douai, which is described in the present paper, was the first of its type built in France.* Work was commenced on it in 1922 by the Bonnet-Spazin Company, who are the licensees of the Augsburg-Nürnberg patent; and it was put into commission in 1923. The capacity of the holder is 27,500 c.m. (970,000 c.ft.), which could be increased on existing lines to 40,000 c.m. (1,412,600 c.ft.). Recently Messrs. Bonnet-Spazin have installed, for the Société du Gaz de Paris, three tankless holders of a capacity of 2000 and 3000 c.m. (70,630 and 105,945 c.ft.). They have also in course of construction the following holders: Sartrouville (15,000 c.m., 529,725 c.ft); St. Etienne Colliery Company (20,000 c.m., 706,300 c.ft.); and Bordeaux (30,000 c.m., 1,059,450 c.ft.).

The main features of the Arbel holder, which is illustrated in the plate appended, are as follows:

1.—An outer shell in the form of an upright 26-sided polygon anchored to a fixed base of 3 mm. ($\frac{1}{8}$ in.) plate on the ground. Two inlet and two outlet pipes M for the gas, all of them 500 mm. diameter (19·7 in.), are fixed to the base-plate.

2.—A movable roller-guided disc A, rising or falling under the pressure of the gas, like a piston, inside the shell.

3.—A roof over all.

The following are some leading dimensions of the structure:

Height from base-plate to eave of roof	36 m.	(118 ft.).
Diameter of circumscribed circle ...	34 m.	(111 ft.).
"Stroke" of disc	30·875 m.	(101 ft.).
Weight of disc	90 t.*	(88·5 tons).
Pressure thrown, W.G.	100 mm.	(3·9 in.).

(* t. = metric tons.)

The shell, the base-plate, and the roof form a rigid structure and offer the maximum resistance to the wind; while the moving disc functions under cover in an absolutely still atmosphere.

The most difficult problem is how to obtain gas-tightness between the periphery of the moving disc and the holder. The rubbing surface must not be dry, for then metal-on-metal friction would have to be contended with. The periphery of the disc is, therefore, fluid-sealed, and the liquid used is tar. Further, in order to ensure that the disc shall rise and fall smoothly, it is obvious that the inner surface of the 26-sided polygonal holder must be absolutely smooth; anything in the nature of a projecting rivet-head is, of course, out of the question. For this reason the holder has been developed in the shape of a polygon. As shown in the illustration, for each division of the holder there is a rigid mounting, shaped to fit the angle formed by adjacent sides of the structure. These angle-pieces join the base to the roof, act as guide-rails for the rollers B, and serve to connect the plates of the shell. These latter are 4 mm. ($\frac{5}{32}$ in.) in thickness, and are strengthened by outwardly flanging the edges, and fitting channel irons thereto. The plates thus strengthened retain a plane surface; while the method of construction enables all rivets to be exterior, thus preserving the smooth interior face of the shell.

There is nothing particularly noteworthy about the roof; it steadies the upper part of the holder, and constitutes with the latter and the base-plate a statically stable structure. In addition it prevents rain and snow from falling on and affecting the disc. A window O admits light into the interior of the holder, and a gallery Q and ladder P facilitate descent on to the top of the disc itself, whatever its height may be. The ladder is a double one, articulated, and conseqently absolutely secure.

The disc or piston A is built up of sheets, and is strengthened with trusses C. In its movement it is guided by as many pairs of radial rollers B as there are angles in the shell. Tangential guide-rollers are unnecessary, in view of the absence of wind-pressure effects. Round the periphery of the disc is the special gas-tight device which is composed of: (1) An annulus K full of tar (see enlarged view); (2) a series of counterbalanced levers which maintain pressure against fitted metal blocks immersed in the tar, and which adjust themselves automatically; and (3) a canvas bearing-piece, one edge of which is fixed to the disc and the other gripped between the blocks and the weighted levers. It will therefore be understood that there is no friction on the bearing-piece, which merely serves to support, over a width of a few centimetres, the weight of the column of tar.

Generally speaking, the depth of tar should substantially balance double the maximum pressure it is possible to obtain from the holder by heavily loading the piston. At the Arbel Works the pressure normally thrown by the piston is 100 mm.; but this can be raised to 300 mm. by loading the disc with concrete blocks weighing 180 t. (177 tons). The depth of tar in the annulus is therefore 626 mm. (25 in.).

The sealing ring does not actually touch the shell, and there is no contact of metal on metal, for there is always a gentle percolation of tar between them. The sliding of the seal blocks upon the shell can give rise to no wear and tear, since the sheeting and the blocks are continually being washed over by the tar; and the friction is absorbed not directly by the metal surfaces, but by the thin film of tar which they enclose. Thus, as the disc rises and falls, the annulus of tar acts as a brush, continually painting the internal surface of the holder.

A descent on to the disc gives immediate assurance of the perfect gas-tightness of the device. Not a bubble can be discovered on the surface of the tar, nor is there the slightest smell. Even without any tar at all the movable disc is sufficiently tight around its circumference to allow during the building of the holder of the gradual raising of the disc by air pressure from a blower; the disc being used as a working platform.

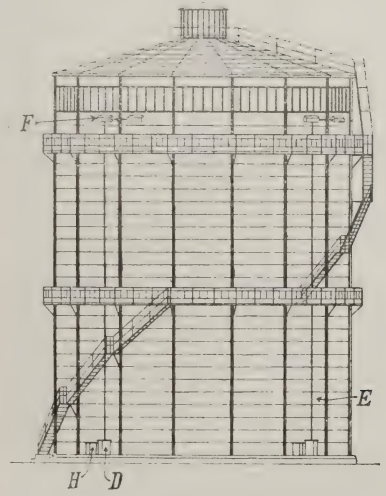
A very small quantity of tar is thus continuously percolating between the disc and the shell; and, flowing down the sides, is collected in an interior annular channel L surrounding the base-plate. Thence it passes through cast-iron pipes into external reservoirs. As the level rises or falls in the latter, floats respectively start or stop small electrically-driven pumps D which raise the tar through the pipe E to a further series of reservoirs F near the top of the holder, whence it flows down the walls to the tar well H of the disc itself. This well is divided at G into as many sectors as there are pumps—eight in the case of the Arbel holder. These divisions are necessary in order to maintain the proper depth of tar in the well, even in the event of the disc taking a tilt from the horizontal. For each division, however, a stand-by pump is provided to ensure the continued supply of tar in case of a breakdown. If too much tar is forced into one sector, the neighbouring ones are fed through overflows.

A $1\frac{1}{2}$ h.p. electric motor suffices to drive each pump; and the duration of run varies according to the viscosity of the tar—in summer not more than eight minutes per hour, in winter once in twelve or even twenty-four hours. The consumption of energy is thus infinitesimal.

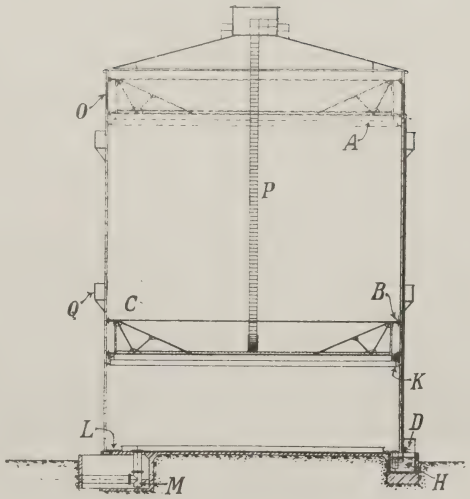
The most satisfactory seal to employ is specially prepared tar. It is to be remembered that the same tar is

* Visited by members of the Société Technique du Gaz and the Institution of Gas Engineers on June 29, 1924, during the celebrations of the Jubilee of the Société and the centenary of the gas industry in France.

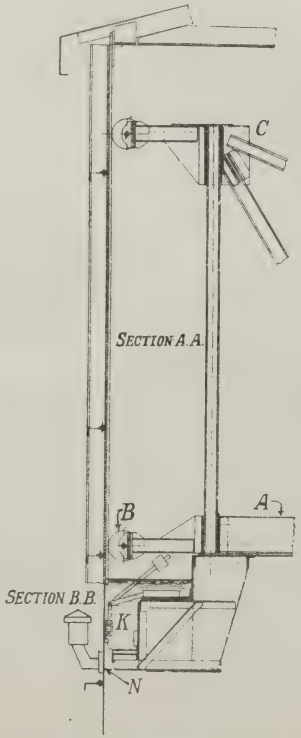
ELEVATION.



SECTION.

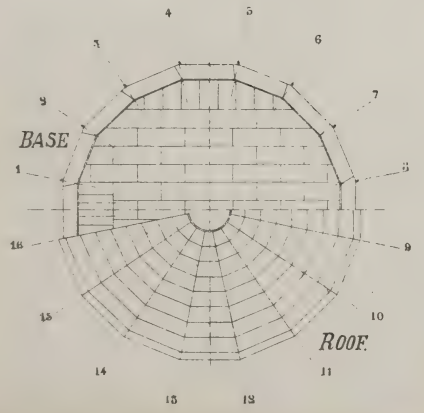


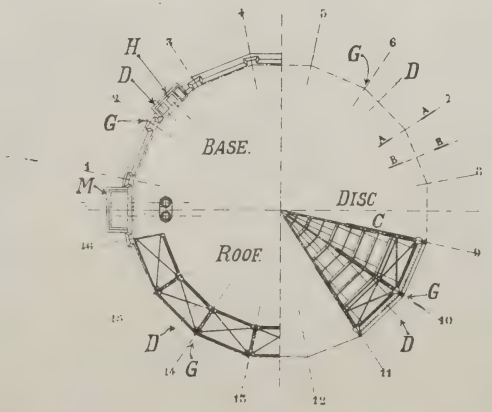
DISC AT UPPER LIMIT.



References.

A. Disc.
B. Guide Rollers.
C. Disc Framing.
D. Motor and Pump.
E. Tar Uptake Pipe.
F. Tar Distributor.
G. Tar Partition in Annulus.
H. Tar Well.
K. Annulus.
L. Tar Channel.
M. Gas Inlet and Outlet.
N. Safety Gas Outlet.
O. Window.
P. Ladder.
Q. Gallery.





circulated over and over again. The essential qualities to ensure are constancy of composition and a certain degree of viscosity at low temperatures. Light oils that might volatilize must, therefore, be eliminated from it. The method of preparation is to maintain the mixture at 60° C. for three hours with aeration. On cooling to 15° or 20° below zero, it must remain sufficiently fluid for an ordinary glass rod (as used in the laboratory) to sink by its own weight, and even submerge itself sideways to some extent.

As a precautionary measure, if gas continues to enter the holder when the disc is at the top of its travel, safety outlets N are provided which are uncovered when the disc reaches its limiting position; and gas escapes into the open air—an arrangement involving no danger, inasmuch as the outlet is at the highest point of the structure.

Tankless gasholders present the following advantages over those of other types: The necessity for warming the tank and the cups is removed; and the possibility of accidents from ice during unexpectedly cold weather or through carelessness during a frosty spell is avoided. Further, there is the saving of the cost of installing the boiler and pipes, and of that of maintenance and running charges.

In telescopic holders, pressures varying from 100 to 300 mm. (3·9 to 11·7 in.) are thrown (the inconvenience of this need not be laboured), while in tankless holders the pressure is constant, for it depends only on the weight of the movable disc as modified by the upward pressure of the gas. If working proves the advisability of so doing, the holder pressure can be increased simply by placing concrete blocks on the disc, without in any way interfering with the working. It has already been pointed out that in the case of the holder at the Arbel Works, the pressure can easily be varied between 100 and 300 mm. (w.g.).

As regards rigidity and resistance to the wind, the stability of the tankless structure is greatly superior to that of the column-guided holder. The disc moves in a closed box and a still atmosphere unexposed to gusts of wind. Columns, on the other hand, can be neither completely rigid nor absolutely vertical, and the lifts of the telescopic holder are subject to violent wind stresses.

Paint, which is an indispensable factor in the upkeep of tanks and lifts, in the case of the tankless holder need only be applied to the exterior of the shell. In other types of holder the interior of the tank, the lifts, and cups can only be painted when the water has been run out; and the metal oxidizes more quickly through being alternately in water and air.

It is impossible to inspect the greater part of the telescopic holder; and during every repair to tank or lifts, anything which falls into and deranges a cup entails draining the tank. In the tankless system the exterior of the holder is always available for painting, while the interior is continually being treated with a coating of tar from the disc annulus. If it is desired to increase the capacity, it is done simply by adding height to the shell, without in any other way encroaching upon the holder. This, however, is a fairly delicate operation, for which it is necessary to take the holder out of commission. As mentioned early in the paper, the Arbel holder has a present capacity of 27,500 cm. (970,000 c.ft.), which could be increased to 40,000 cm. (1,412,600 c.ft.).

In building a "wet" holder, in order to attain the required solidity, it is necessary to carry out much excavation and lay heavy foundations over the whole required area of ground. Settlements are by no means rare under the mass of water; tanks are apt to lose their shape or to crack; and repairs are difficult and costly. In the case of tankless holders, however, strong foundations are only necessary beneath the foundation ring of the shell; and here an earth resistance of about 1 kg. per sq.cm. (15 lbs. per sq.in.) usually suffices. Inside the ring, thin concrete is sufficient; and in the case of the Arbel holder there is only a bed of clinker concrete 10 cm. (3·9 in.) thick beneath the base-plate. Under the foundation ring of the shell there is broken-brick concrete 3 m. (9·8 ft.) deep and 30 cm. (11·8 in.) thick on a base 1·60 m. (5·2 ft.) wide by 23 cm. (9 in.) high. The total pressure carried by the earth below the foundations, including an allowance for wind stresses, is 1·130 kg. per sq.cm. (16·5 lbs. per sq.in.); and if the weight of the foundations themselves is omitted, it amounts to only 0·692 kg. per sq.cm. (10·1 lbs. per sq.in.).

Against these advantages, the only inconvenience that can be set is possible irregularity in the working of the tar pumps, and their running costs. But it has already been explained that, owing to the arrangement of partitioning the wells and fitting them with weirs, several pumps can be out of action without the slightest danger arising; and, as for the consumption of energy, this is insignificant. The Etablissements Arbel are absolutely satisfied with the regular working of their holder.

As to financial considerations, it may be stated that, up to a capacity of 10,000 cm. (353,148 c.ft.), the cost of a tankless gasholder is substantially the same as that of a holder with tank. Above 10,000 cm. the tankless type of holder shows an economy in construction of 5 to 20 p.ct. in its favour, according to the dimensions. That there is not a greater saving is explained by the fact that, while the amount of metal needed is very considerably reduced, the necessarily precise plating work called for by the tankless design is costly.

Discussion.

The PRESIDENT: We have here a very interesting and valuable paper on the tankless gasholder. A number of the members saw the holder at Douai when we were in France, and were much interested. I was so much interested that I have been over to Paris to see one of the holders there at work and one under construction, and I venture to think that it will not be long before some of the municipalities and companies erect these holders in this country. There is no doubt that, though the ordinary telescopic gasholder with water, and a brick or steel tank, has served us well, there is a great deal to be said for the tankless design. One of the most important things is that, if we have tankless holders, we shall be able to supply dry gas, and that would be an important matter where gas is distributed over large areas. The tankless gasholder has passed beyond the stage of experimental work, and is now a practical reality. The author of the paper has told us that the tank at Douai is capable of being increased to a capacity of 1½ million c.ft. I believe in America an order has been placed for a tank of a capacity of 4½ million c.ft., and that on the Continent orders have been placed for very large ones. One of the largest and most prominent American gas engineers has informed me that, so far as his Company and those he represents are concerned, he should recommend in the future that they use tankless holders. I shall now be very glad to have comments upon the paper, and especially from those who have had practical experience in this construction of gasholders. At the same time I am sure I am expressing your opinion when I say that we feel very much indebted to the French Society for presenting us with this paper.

Mr. J. P. LEATHER: I think we must echo what the President has said in thanking our French friends for giving us this paper. With regard to the tankless gasholder, I need not go into the question of the advantages mentioned in the paper; but there occur to me one or two disadvantages. I will first name one which is not very substantial—that the holder is always up. A holder is always rather an eyesore, and we are sometimes found fault with for having huge ones projecting into the sky and obliterating the view. At any rate I have had that experience, because there has been rather strong condemnation of a holder I recently erected, on the ground that it prevents people having a view of the country. These tankless holders will always be up, and you will not be able to see between the piers. Another question that has occurred to me is that, after all, the wind must have a considerable effect on these structures. To begin with, the plates between the supports are flat, and a strong wind will certainly tend to bend them slightly inwards. Further than that, unless there is a fairly strong framing, the framing will yield just as much as the framing of an ordinary column gasholder. I know the question of the yield of the framing of the latter is treated differently in some Continental works from what we have been inclined to do in England. Certainly my own practice has been to make a fairly strong framing; but on some works on the Continent the framing does not seem to be made of anything like such large-section columns as we have here. With the tankless holder you have the pressure of the wind on the tank or on whatever you call the structure, just as much as you have in an ordinary holder; and when you have a strong wind, it must have some effect. And as the disc is naturally very rigid, there must be a tendency to alter the space between the disc and the tank at certain points. I do not know whether our friend who has read the paper can tell us anything as to the experience in this respect—whether anyone has been on the disc when there has been a strong wind, and seen what the effect is.

M. BARIL, who replied in French, said that in countries where the wind is very strong means are taken to make the holder more rigid by strengthening the flanges and sheets. The wind in some parts of the Continent is not so strong as in England, and it is not necessary to construct so rigidly as would be the case in this country. Where gales are usual, the diameter of the holder is increased.

Mr. R. J. MILBOURNE: I appreciate very much the paper

which has been read, giving a description of the gasholder which most of you saw when the Institution visited France last year. I have had the pleasure and the privilege of seeing not only that holder, but a number of others of the tankless type which have been at work for a considerable time; and on each occasion my mission was undoubtedly to find out the defects of this particular system, because, as no doubt you are aware, I am interested in a Company which has taken up the patent rights for Great Britain. I must say that we have never been able yet to find a gas engineer who is working these tankless gasholders to say that there is any disadvantage whatever; on the contrary, they all say that there is undoubtedly a great advantage by adopting this particular system. One of the principal considerations which, it appears to me, commends this design to the notice of the English gas engineer is that it prevents the corrosion of sheets, such as we have in an ordinary water gasholder. The exterior is very easily painted and very "get-at-able" from the platforms which, I think I might mention in answer to Mr. Leather, not only serve the purpose of giving easy access to the exterior of the holder, but are added in accordance with calculations to give the necessary strength to the whole of the structure. As to the point of wind pressure—undoubtedly there is a continual pressure on the surface of a tankless gasholder; but the type is in a much better shape and form to withstand the wind pressure than is an ordinary guide-framed or spiral holder. Another consideration which is well worth notice is the interior of the structure; from my experience, during the past few years at all events, due no doubt to the present methods of carbonization and probably purification, there is a greater tendency for the ordinary gasholder to corrode from the inside. Until 15 years ago it was my experience that the inside of a holder was as pure and as safe from corrosion as could be desired at any time, and that the action of the gas which was then made—I suppose you would call it "straight" gas—caused no inconvenience from any corrosion on the inside sheets. It has, however, recently been my experience that corrosion does take place from the inside; and I have had the opportunity of talking over this particular point with a very eminent gas engineer who visited England last year, who informed me that they found in the Colonies that this particular difficulty is causing them great concern. If that is so, the tankless gasholder undoubtedly offers a very excellent design for the prevention of internal corrosion, as the inside is continually coated with tar, and therefore corrosion cannot take place. The other little difficulty which might naturally at first sight appear, is the question of the working of the pumps; but as the writer of this paper has pointed out, there are a number of pumps, and at the time the holder is being erected the disc is practically tight without any seal of tar being added. At the time I first visited the holder at Douai, during erection, the disc was up—I should think within about 10 ft. of the top—but there was no apparent leakage, so that it does not seem to me from the experience I have had that the danger of leakage with these particular holders is very great. I do recognize, however, that the English gas engineer is particularly conservative, and will no doubt need to have an actual example in this country under test before this particular type of holder makes much headway. Of course in England this particular type of gasholder will have a very serious competitor, as regards the cost of the holder, in having to compete with the spiral holder; and I should think the economical size would be much above what the writer of this paper says is the case on the Continent. They do not on the Continent, for some reason which is best known to themselves, adopt the spiral holder; and it is only in England that we use that particular type of construction to any great extent. I do not know that I can add any further useful remarks; but Mr. Gill, who is present, has had the advantage of seeing the particular type which is being erected by the Americans, and no doubt he will be able to tell us something about them which will interest us.

Mr. G. M. GILL: I have really very little to say about the tankless gasholder, but there is one matter which might possibly interest you. When I was recently in America, the builder of the tankless gasholders there told me that he had orders for an aggregate capacity of 65 million c.ft., and included in that were two or three tanks of 15 million c.ft. capacity each. This, I think, shows you the way the American gas engineers at any rate are looking at this problem. Mr. Milbourne mentioned that this was the only country where the spiral holder has made any headway. In America there seemed to be hardly any—I think I did see a small one somewhere, but they have not taken up that design at all. I notice the old type of gasholder has been referred to as the "wet" holder. It may be that if the new type is the "dry" gasholder, that may be a reason why the American gas engineer has shown a tendency to adopt it. (Loud laughter.)

M. BARIL then gave the following supplementary remarks. The Société d'Eclairage, Chauffage, et Force Motrice, who supply the suburbs of Paris, also have a tankless holder of 6000 cub.m. capacity, which was successfully put into commission some weeks ago. This holder was ordered as the result of a visit by M. Bazille, Chief Engineer at the Gennevilliers Works, to holders of the same type in Mügeln (1000 cub.m.), Waldenbourg (27,000 cub.m.), and Staaken (60,000 cub.m.). The economy realized by us by installing this tankless holder is not great, but it was selected owing to the small space occupied—the diameter of a circumscribing circle is 19.5 m., while that of an ordinary one-lift holder of the same capacity would be 30 m. The "E.C.F.M." Company are very interested in these holders, and we wish to enlarge on the following features: (*a*) Means of access to the piston. In the improbable, but possible, event of a man being overcome by gas when inside the holder, the collapsible ladder, easy enough for an able-bodied man to negotiate, would present great difficulty to one burdened with an unconscious comrade; and to overcome this difficulty, manholes have in some instances been fitted to the shell at various points of the piston travel. (*b*) Tar for the joints. It is very difficult, if not impossible, to find a material exactly answering the specification of the builders. At Gennevilliers a mixture of dehydrated tar, 75 p.ct., and anthracene oil, 25 p.ct., is employed; but it will probably be necessary to increase the quantity of oil in the winter. (*c*) Pumps. In the event of a sudden drop in the temperature, it is probable that the pumps will labour in starting up, owing to the greater viscosity of the tar; they may even refuse to start, if driven by high-speed motors. The exposed piping, therefore, should be lagged. Further, as there is a danger of the electric circuit fusing, it may be advisable to start up the pumps by hand, and a safeguard is to run groups of pumps in parallel. Another danger lies in the possibility of the public electricity supply failing; and it is as well to have a private stand-by generating plant. As a final protection, a small tar tank sheltered from the cold may be placed under the roof of the holder.

Mr. FRANK PRENTICE (Ipswich): I should like to ask why such a large number of pumps are required to fill the tar receptacles. Is it not continuous all the way round, or are there a number of separate tar receptacles to be sealed, and therefore a large number of pumps required? It would be interesting to have a reply to this.

M. BARIL explained that several pumps are installed owing to the tar ring being partitioned. Otherwise there would be a risk of the tar flowing to one side and putting the structure out of level. He added, however, that, not being a constructor of these tanks, he was not able to discuss the small points of detail in design.

Mr. GEORGE C. PEARSON (Birmingham): I would like to ask if any troubles have arisen in connection with the canvas bearing-piece. It appears from an examination of the design that there is a canvas-bearing piece which holds the tar against the sides of the tank, and that the action of the piston rising and falling would rub it against the sides of the tank. If this canvas gave way, it might be a serious matter; and it might be very difficult to replace it.

Mr. JOHN FOSTER (Birmingham): Supposing you get a holder working up and down three and four times a day, as we do in Birmingham, what effect would that have on the top seal?

The PRESIDENT: In reply to the last speaker, when I was in Paris, the holder was rising and falling very intermittently, and was used very much more than an ordinary holder. I was told by the engineers there that they had no trouble whatever, and such working is, of course, a very much more severe test in the case of the tankless than in the case of the ordinary holder. I may say that there will be a model of the tankless holder at the Litchurch Works at Derby on Friday, and the members will be able to see it. I have arranged with Mr. Milbourne to be there, and he will be very pleased to answer any questions that may be put to him.

Mr. CHARLES F. BOTLEY (Hastings): I am sure we all appreciate the fact that our friend from France has addressed us in our own language in reading this paper—a task which some of us would not like to essay in the opposite direction. He has also given his replies in his own beautiful language, and we have had our friend M. Zollikofer to interpret them for us. I should like to have added a remark or two; but as we are going to view a model, perhaps my questions will be answered then. At the same time I must express my disappointment that this design of tankless holder cannot be produced more economically. It seems to me a great pity that something of this kind is not available at a lower cost. Also might I venture to say that there may be other reasons for the corrosion of gasholders than that due to the kind of gas which is now manufactured. I think there are several with which most of us are acquainted. We are greatly indebted to our friend, and I have great pleasure in moving that we give him a hearty vote of thanks not only for the information, but also for being so good as to address us in our own language.

Mr. SAMUEL TAGG (Preston): I regard this valuable paper as a graceful extension of the kindly facilities which the French engineers offered us last year. I am sure we are very grateful both for the paper and to M. Baril for his services in reading it to us in the absence of the author. I have much pleasure in seconding the vote of thanks.

The PRESIDENT: I am sure it requires no words of mine to emphasize the vote that has been proposed and seconded. We all have very pleasant recollections of our visit to France, and we are delighted that some of our French confrères are at the meeting to-day.

The vote of thanks was carried with acclamation; and M. Baril briefly expressed his appreciation of the manner in which the paper had been received.

SELECTION, DESIGN, AND CONSTRUCTION OF NEW CARBONIZING PLANT AT STRETFORD.

By W. M. CARR, of Stretford.

The question of the selection of carbonizing plant is a problem which has become increasingly difficult during the last few years, owing to the great fluctuation in the relative values of coal and residual products. It is a problem with many varying aspects depending upon the situation of the gas-works, local conditions, available coal supplies, and residual markets; and the plant which most satisfactorily meets the requirements of one undertaking may prove less successful in another differently situated.

From the economic standpoint, the most desirable carbonizing plant is the one best equipped to meet the variation in the commercial values of coal and residual products. First, consideration must be given to the special requirements of the particular undertaking; and in this respect the efficiencies of various types of carbonizing plant, having regard to local conditions, come under review.

The types of plant in general use may be summarized as follows :

1. Complete gasification plant, giving a high yield in gaseous therms, with no residuals except liquid products.
2. Vertical retort installations, giving a high yield in gaseous therms with steaming, reduced quantity of coke of low calorific value, and maximum liquid products.
3. Coke and chamber ovens, giving a medium yield in gaseous therms, special quality of coke, and maximum liquid products.
4. Horizontal retort installations, giving a high quality of gas, with medium yield in gaseous therms, domestic coke, and residuals.

The variations in the arrangements of the above types of plant are well known, and are much too numerous to come within the scope of a paper of this description. It is the author's intention first to deal generally with the special circumstances affecting the selection of carbonizing plant at the Stretford Works.

The works, on transfer to the Stretford and District Gas Board in September, 1923, occupied a site of approximately 7⅕ acres adjoining the Bridgwater Canal. The first work carried out by the Board was the laying down of a railway siding, which, owing to the situation of the main line and existing plant, had to be brought in on the side of the works opposite to the canal. The then existing carbonizing plant consisted of two benches of 8 beds, each bed set with 8 horizontal retorts, 22 in. by 16 in. by 20 ft. long, D-shaped, in three tiers, with 6-in. ascension pipes on both sides of the retort benches, operated by an electrically-driven charging and discharging machine supplied from continuous overhead coal hoppers supported from cross girders on stanchions erected independently of the brick-built retort house.

Coal stores were provided on both sides of the house; and for handling canal-borne coal, a trunk elevator, shovel-fed from the barges, and a steel plate conveyor were utilized to convey the coal to a breaker pit and elevator on the canal side. A corresponding breaker pit and elevator was in use on the discharging side of the retort house; and this was also fed from the canal by means of an electrically-driven coal telpher and grab running on a reinforced concrete telpher track across the gable end, and thence parallel to the retort house to the breaker pit. The elevator on the discharging side was also used for feeding rail-borne coal, which was carted into the works to the retort house. The removal of coke from the house was by means of telpher machine and track passing through the gable end to storage ground, with quenching tank immediately outside the house.

The maximum capacity of the coal-gas plant was then 2,250,000 c.ft. per diem. In addition there is a carburetted water gas plant of a capacity of 500,000 c.ft. per diem. The maximum capacity of the gas-making plant was, therefore, 2,750,000 c.ft. per diem. It should be here pointed out that the condensing, washing, and scrubbing plant was barely sufficient to deal with the then maximum make of coal gas.

During 1923 there was a large increase in the consumption of gas. The send-out for the year was 641,000,000 c.ft., as compared with 485,000,000 c.ft., the output in year 1921. The maximum daily send-out during the winter of 1923-24 was 2,609,000 c.ft. compared with a maximum of 2,138,000 c.ft. in the previous winter. The margin of spare gas-making plant available was, therefore, exceedingly small.

The district served by the undertaking includes the intense industrial area of Trafford Park, as well as a rapidly growing residential area; and it was considered that in the laying-down of new plant it would not be prudent to take as the figure of growth the usually accepted figure of 5 p.ct. per annum compound increase, but to provide for 7½ p.ct., which is equivalent to doubling the output in approximately ten years. It was obvious that extensions could not be carried out without involving a large expenditure for the alteration and removal of existing plant, as the works, in part, were far too congested. Moreover, the coke and coal handling arrangements were cumbersome and costly in operation.

The general trend of development in carbonizing plant in recent years has been in the direction of obtaining the highest possible yield in heat units in the form of gas rather than in the form of gas and residual products. It will be freely admitted, however, that it does not necessarily follow that the highest yield in gaseous heat units will mean the cheapest gas, especially at times when prices of residuals are high in relation to the price of coal; and as the Stretford undertaking is situated in close proximity to the Lancashire and Yorkshire coalfields, where plentiful supplies of cheap gas-making slacks are available, this consideration was one which primarily influenced the author in the selection of plant.

The main points affecting the selection may be summarized as follows :—

1. The works are conveniently situated, with low carriage rates by rail and canal, for the purchase of cheap gas-making slacks. As an indication of value in this respect, it may be stated that the average price of good-quality washed or dry slack of ½-in. size is, on the values of the past twelve months, approximately, 6s. to 7s. per ton less than the price of gas nuts from the same seams. It was considered essential, therefore, that the selected plant should be capable of successfully carbonizing fine slacks.
2. A good local demand for gas coke exists in the area; there being large buyers for industrial purposes, and also a large and extensive market gardening demand in the out-districts.
3. In view of the rapid growth of the undertaking, it was considered desirable that the gas to be supplied should be of high calorific value, in order to defer as long as possible capital expenditure in providing mains of increased capacity, also in the provision of additional gas storage.
4. It was considered essential that the capital cost should be kept as low as possible compatible with efficiency, as the undertaking had recently changed hands, in the process of which the standing capital charges had been increased by 140 p.ct.
5. The plant generally should be such as could be worked in a manner to reduce to a minimum laborious work.
6. The conditions of the Gas Regulation Act necessitate at the present time that the yield of gas should be of a continuous and even quality.

It may, to a certain extent, be claimed that the three principal systems at present in use for high-temperature carbonization—*i.e.*, vertical retorts, chamber ovens, or horizontal retorts—would meet these requirements.

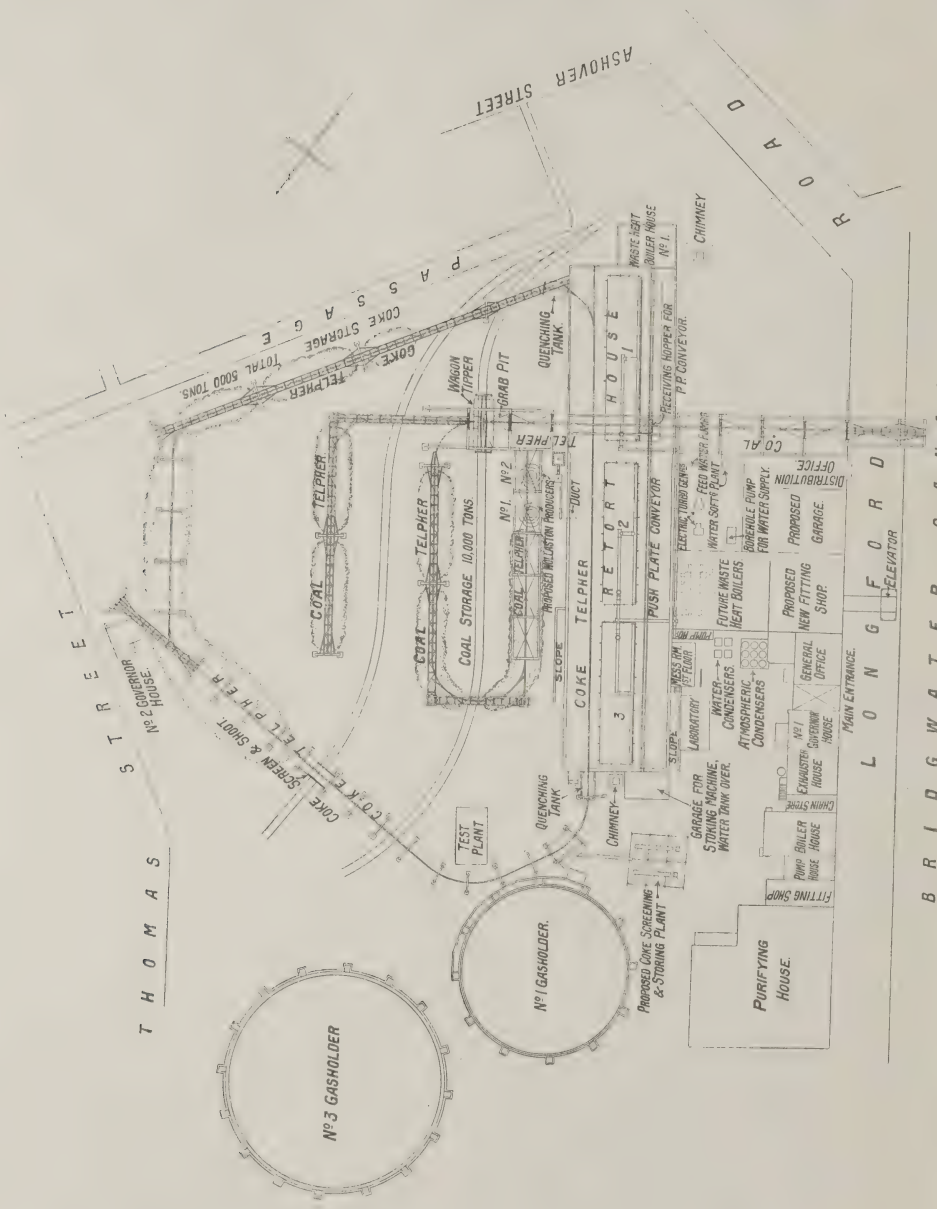


FIG. 1.—GENERAL SCHEME.

The advantages of a vertical retort installation over the other two systems lay in possible lower labour costs and cleaner working conditions. It was considered, however, that these would not outweigh the disadvantage in the matter of higher costs occasioned by restricted choice of coals, especially in the case of the Stretford undertaking, where only slacks are carbonized.

The small coke oven or chamber oven installation, such as has, in recent years, been extensively put down in America and on the Continent for gas-works purposes, offered attractions in that increased efficiency in the matter of fuel consumption was claimed in the case of ovens heated by means of reversible recuperators with gas from outside producers. The disadvantages of this type of plant are that the units are somewhat large for a medium-sized undertaking, and arrangements for charging and coke handling are not so simple as when dealing with smaller retort units. Moreover, with a large unit and long carbonizing period there is the possibility of greater variation in quality between charging times, especially having regard to the size of the plant as a whole.

Careful estimates were prepared of the probable working costs on a make of 650,000,000 c.ft. per annum, with a chamber oven and with a horizontal retort installation, taking the raw coke consumption of chamber settings with reversible regenerators and outside producers at 12 p.ct., and at 15 p.ct. in the case of the ordinary horizontal retorts, from which it appeared that the additional revenue from the extra yield of coke would be almost counterbalanced by the extra capital charges. Moreover, the class of coke produced from fine slacks in chamber ovens would probably have been unsuitable for domestic purposes.

There was a further consideration affecting the selection of plant—viz., that a portion of the new plant should be available for gas-making for the winter of 1924-25, in view of the increased output, and horizontal retorts, being more standard practice than chamber ovens, could be more rapidly installed. It was therefore decided to extend the existing horizontal retort house by the addition of a new bench of 9 beds, each containing 10 horizontal retorts 24 in. by 18 in. by 22 ft. long, and on completion of this extension to reconstruct the existing house, and replace the existing benches by two benches each of 8 settings on the same lines as the extension; making the total capacity of the extended and reconstructed carbonizing plant 6,000,000 c.ft. of straight coal gas per 24 hours, the whole of which could be operated by one set of stoking machinery, and coal and coke handling plant.

The advantages of the type of plant selected, so far as the Stretford undertaking is concerned, are :

1. Any class or grade of gas-making coal can be used down to the finest slacks.
2. The capital outlay necessary is the minimum, having regard to the site and conditions as to coal and coke handling.
3. Residual yield in the form of coke is high in relation to the coal carbonized, on account of more efficient heating and less radiation losses than with vertical retorts.
4. Maintenance charges are low, and horizontal retorts are easily repaired when in operation.

Fig. 2.—Wollaston Producer.

The carbonizing plant as laid down, and in course of construction, has several new and important features; and before dealing generally with the design of the plant, it would be as well to call attention to the circumstances which led up to the new departures in the arrangements for the heating of the settings. None will gainsay that considerable economies could be effected were it practicable to utilize coke breeze for the purpose of heating retort settings. At the time the type of plant to be installed was under consideration, the author had occasion to carry-out a series of tests on a gas producer installed for the purpose of boiler firing, which had been specially designed to gasify cheap slacks. In the course of these tests it was decided to test the producer running on coke breeze.

The plant in question was designed by Mr. T. Roland Wollaston, M.I.M.E., of Manchester, and consists of a producer of normal design with a super-imposed chamber or retort through which the fuel is passed over a series of trays, by means of mechanically-operated turning arms, until it reaches the producer itself (see fig. 2). The object of this retort is to enable the producer to handle a wide range of fuels, and to gasify fine slacks containing a large percentage of ash. Efforts have previously been made to coke or partially coke the incoming fuel to a producer by the outgoing producer gas, but with partial success only. The principal cause of failure was indirect heating causing uneven coking; and the swelling properties of the coal have prevented the free passage of the gas, and direct and intimate contact with the whole body of the fuel. In the "Wollaston" retort, the fuel is not packed together, but is spread out, and kept in motion in the chamber, in which there is ample room for the passage of the hot gas in intimate contact with the fuel. Further, the mechanical action ensures that all particles of the fuel are exposed and subjected to direct heat transference. As a result, a fair percentage of the volatiles are distilled off, and the finest slack on discharge from the retort is sufficiently coked to form a good producer fuel. When operating on coke breeze, the retort acts as an efficient drier; and no difficulty was experienced in successfully gasifying breeze which had been passed through a ½-in. mesh. It would appear, therefore, that the difficulties previously experienced in gasifying breeze in forced-draught producers were due to the moisture content closing the interstices in the breeze particles lying in close contact, so preventing the free passage of the blast.

As a result of the foregoing experience, the author concluded that there were considerable advantages to be gained by the use of outside producers which could successfully gasify coke breeze or the cheapest slack coals, as the fuel would be very much cheaper than the gas coke used in the self-contained producers. Against this, however, must be taken into account the radiation from the producer, and the sensible heat of the gas which is lost in the case of external producers. The difference in overall heat efficiency on account of these losses is approximately 16 p.ct.

Outside producers have previously been used for heating retort settings. The heating efficiency of such producers is, however, naturally less than the self-contained type using coke in both instances, but to the extent of utilizing coke breeze their economy is certain. An advantage of external producers is that a portion of the gas therefrom can, in case of necessity, be used as a diluent for the straight coal gas from the horizontal retorts, when it is desired to reduce the calorific value of the gas made to (say) 500 B.Th.U. for the purpose of distribution.

Following an investigation of the possible economies consequent upon the heating of the settings with gas from outside producers using cheap fuels, the question of heating by coal gas was taken into consideration, as it has often occurred, in the case of gas-works situated in the vicinity of the coalfields where cheap supplies are available, that the yield from residuals equals the cost of coal, or nearly so. In such instances, where there is a sufficiency of carbonizing plant, the heating of the settings by coal gas is an economic proposition.

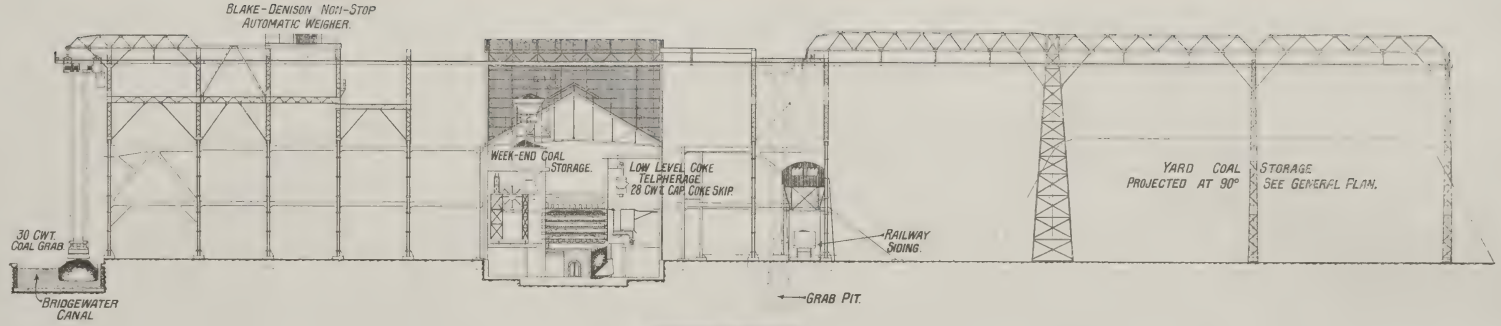
Assuming the thermal efficiency of carbonization is 80 p.ct., and of gasification of coke in producers 75 to 80 p.ct., the cost per therm of coal gas or producer gas may be taken as being proportionate to the prime cost of the fuel; and, generally speaking, when the value of coke is higher than the price paid for coal, the heat units produced as straight coal gas are cheaper than the heat units produced from coke as producer gas.

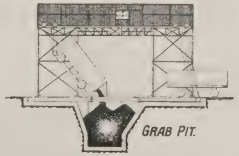
The average efficiency of the ordinary self-contained producer utilized for heating retort settings does not normally exceed 80 p.ct. Allowing, however, for the advantage of the sensible heat of the self-contained producer gas, which is lost when firing with gas from outside sources, it is safe, for the purposes of making a comparison of the cost of gas and coke firing, to take 40,000 c.ft. of coal gas (of, say, 520 B.Th.U. per c.ft.) as being equal to one ton of coke.

Assuming the retort-house cost of coal gas 6d. per 1000 c.ft. (the actual net cost of coal gas averaging 520 B.Th.U. per c.ft. into holder at the Stretford Works during the twelve months ended March 31, 1924, was 5'7d. per 1000 c.ft.) the relative costs of heating by gas and coke are as follows :

Gas, 40,000 c.ft. at 6d. per 1000 c.ft. = 20s.
as against
Coke having a works value of . . . . 27s. 6d. per ton.

These figures, on the basis of per ton of coal carbonized,


BLAKE-DENISON NON-STOP AUTOMATIC WEIGHER.
WEEK-END COAL STORAGE.
LOW LEVEL COKE TELPHERAGE. 20 CWT. CAP. COKE SKIP.
YARD COAL STORAGE PROJECTED AT 90° SEE GENERAL PLAN.
30 CWT. COAL GRAB
BRIDGEWATER CANAL
RAILWAY SIDING.
GRAB PIT.



SECTIONAL ELEVATION OF DOUBLE 20 TON TRUCK TIPPER.

FIG. 3.—COAL GRAB AND TELPHER DETAIL.

FIG. 5.—EXISTING HOUSE AND EXTENSIONS IN COURSE OF CONSTRUCTION

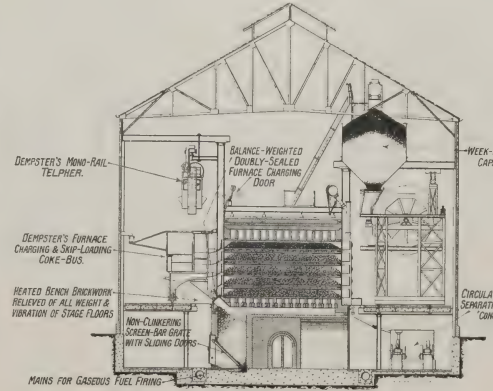

DEMPSTER'S MONO-RAIL TELPHER.
BALANCE-WEIGHTED "DOUBLY-SEALED FURNACE CHARGING DOOR
WEEK-END COAL CAPACITY
DEMPSTER'S FURNACE CHARGING & SKIP-LOADING COKE-BUS.
HEATED BENCH BRICKWORK RELIEVED OF ALL WEIGHT & VIBRATION OF STAGE FLOORS
NON-CLINKERING SCREEN-BAR GRATE WITH SLIDING DOORS
MAINS FOR GASEOUS FUEL FIRING

FIG. 6.—CROSS-SECTION OF NEW HOUSE.

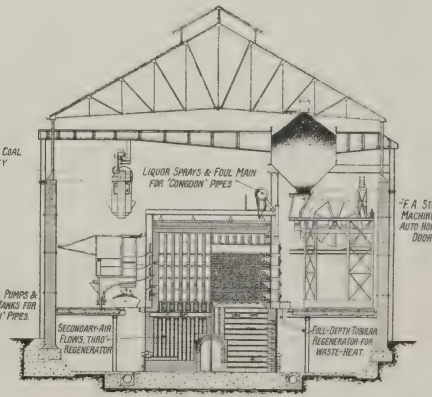

LIQUOR SPRAYS & FOUL MAIN FOR "CONGDON" PIPES
"F.A. STOKING MACHINE & AUTO-HOPPER DOORS
CIRCULATING PUMPS & SEPARATING TANKS FOR "CONGDON" PIPES.
SECONDARY-AIR FLOWS. THRO'-REGENERATOR
FULL-DEPTH TUBULAR REGENERATOR FOR WASTE-HEAT.

FIG. 7.—CROSS-SECTION OF OLD HOUSE RECONSTRUCTED.

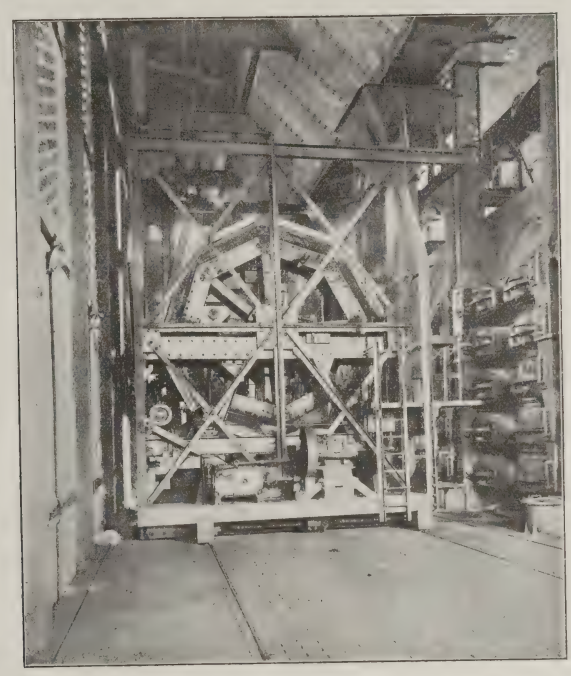


FIG. 8.—"F.A." STOKING MACHINE.

assuming that the coke consumed in the furnaces is $2\frac{1}{2}$ cwt. per ton of coal, would be :

Coke firing . . = 3s. $5\frac{1}{4}$d. per ton of coal carbonized
Gas firing . . . = 2s. 6d. ,, ,, ,, ,,

In the case of the figure of the cost of gas firing, there is, however, an additional $2\frac{1}{2}$ cwt. of coke per ton of coal which would be available for sale on the total throughout —equivalent to 3s. $5\frac{1}{4}$d. per ton of coal carbonized. After deducting the extra wages costs (at, say, 1s. 6d. per ton) on the additional weight of coal to be carbonized, the net cost of gaseous firing per ton of coal is $6\frac{3}{4}$d.—equivalent to a gross difference of 2s. $10\frac{1}{2}$d. per ton of coal carbonized. It should here be pointed out that no account has been taken in the foregoing figures for maintenance and capital charges on the extra carbonizing plant necessary in the above circumstances if the settings were entirely heated by coal gas; and a reasonable estimate for the above is 17d. per ton. This reduces the possible saving by coal-gas firing by one-half.

On the basis of the above figures, during the year 1924, had surplus carbonizing plant been available, and the whole plant adapted for firing by coal gas, a saving of approximately £4000 could have been effected on a make of 641 million c.ft.

The foregoing conclusions have been put forward in this paper as indicating the line of thought which led up to the evolution of the special regenerator setting which has been installed at Stretford.

It has been pointed out that it was essential that the plant should be in operation for the heavy load in the winter of 1924-25; and the time available would not permit of the immediate laying-down of auxiliary external producers such as the author has indicated, and which were then only passing from the experimental stage. It was decided, therefore, that the settings to be erected should be arranged with self-contained producers to work on normal lines, and, alternatively, for gaseous firing from external sources with producer gas, coal gas, or a mixture of both. It was considered essential to the efficiency of this latter provision that the gas and air for purposes of combustion should enter the combustion chamber of the setting at approximately equal temperatures; and to this end the author in conjunction with Mr. H. J. Toogood, of Messrs. Robert Dempster & Sons, Ltd., of Elland, the contractors for the retort benches, evolved a special setting which is provided with a self-contained producer of large area, and in addition has separate and distinct regenerator flues heated from the waste-gas flues, both of which are used for pre-heating the secondary air when the setting is working with its own producer, and which can be used alternatively for heating gas and air when firing with gas from external sources.

Design of Plant.

The general arrangement of the carbonizing plant, with coal and coke handling plants, is shown on the plan (fig. 1). A factor affecting the design of the coal handling plant was that the facilities for receiving coal by rail or canal should be maintained. At the same time, it was desired to concentrate the coal storage, as far as possible, on one side of the house, instead of on both sides, as existed. In order to provide sufficient space for the extension of 9 beds, it was necessary to remove a portion of the existing reinforced concrete coal telpher track passing across the gable end of the retort house. It was decided to adopt electrical telpherage for the coal handling, as by this arrangement the whole of the coal, except that required for stock, could be elevated in one operation. The new track between the Bridgwater Canal and the railway is carried over the top of the existing concrete trestles with girders spanning the retort-house extension, and is extended beyond the railway on steelwork towers and girders in two arms over the coal stores, running at right angles to the main track. The arm nearest the retort house is returned along the top of the old ferro-concrete structure parallel to the house to be utilized for feeding the proposed external producers.

The plant has a capacity of 40 tons per hour, and is capable of dealing with coal by means of a 30-cwt. grab either from barges on the canal or from the grab pit which is fed from the railway by a double-ended wagon tipper of the overhead type arranged to deal with 10-20 ton trucks, so that delivery from either end of the track is possible without turning round. To carry the super-imposed steelwork, and also the larger and heavier machine, the reinforced concrete structure is strengthened by means of external channels and internal angles strapped together across the columns of the concrete trestles, the

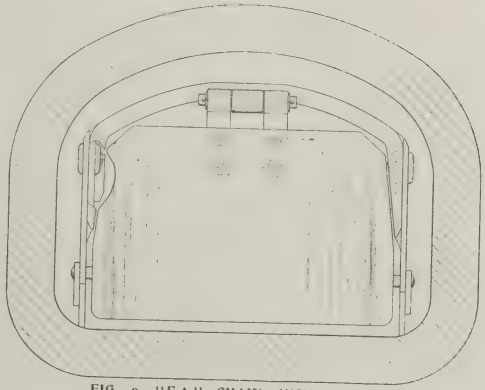


FIG. 9.—"F.A." CHAIN, INSIDE DRIVE.

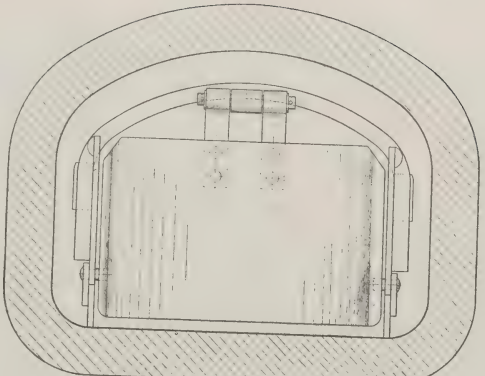


FIG. 10.—"F.A." CHAIN, STANDARD OUTSIDE DRIVE.

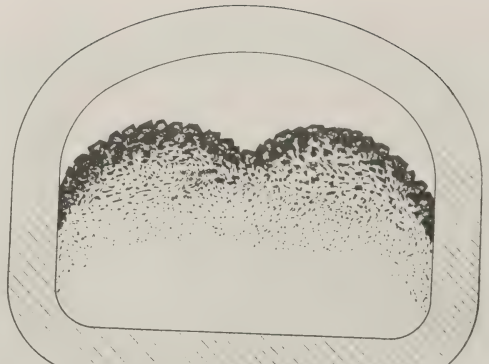


FIG 11.—SECTION OF CHARGE LEFT BY IMPROVED CHAIN WITH OUTSIDE DRIVE.

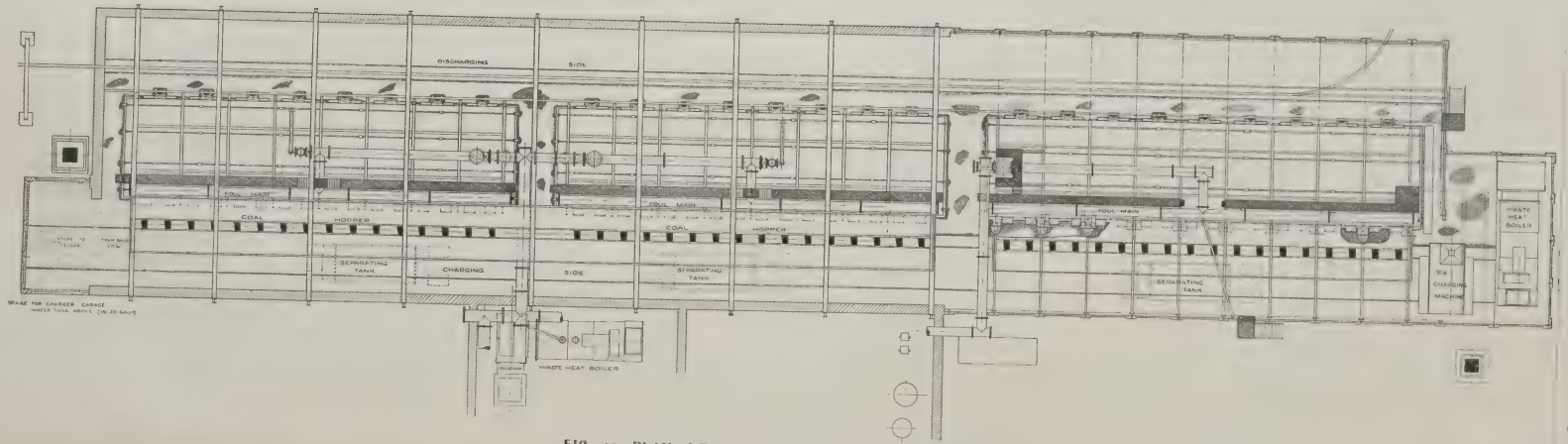


FIG. 12.—PLAN, NEW AND RECONSTRUCTED BENCHES.

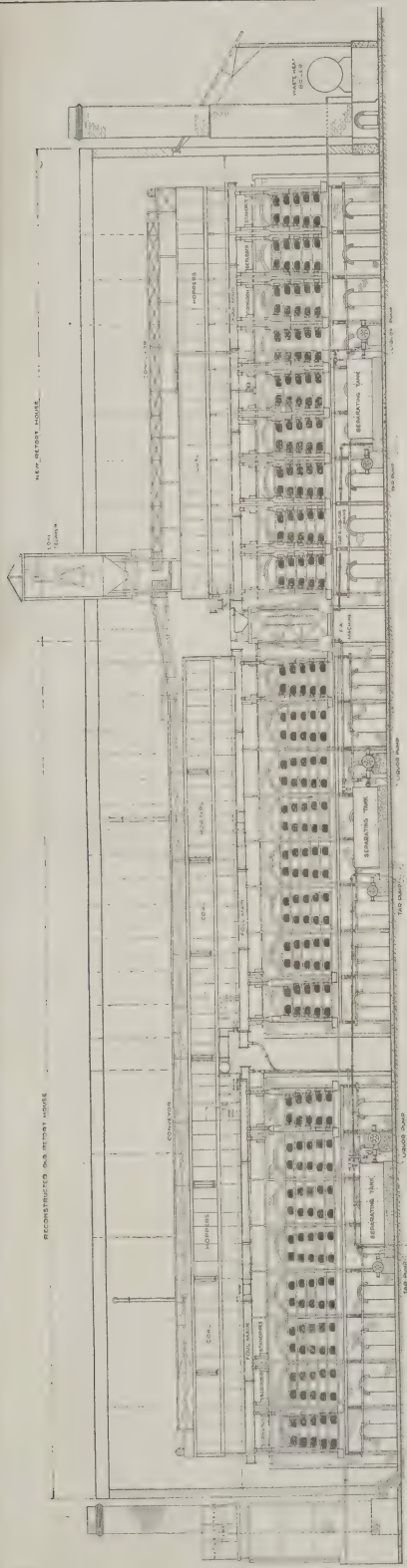


FIG. 13.—ELEVATION OF NEW AND RECONSTRUCTED BENCHES.

whole being braced with diagonal angles, the foundations being increased proportionately for the extra loading.

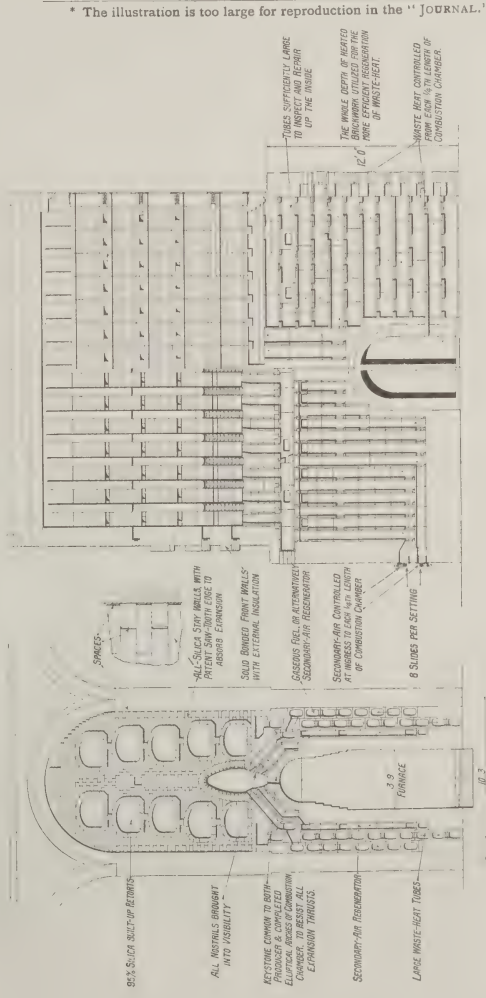
The increased height of the track over the existing reinforced concrete track is 23 ft. 6 in., making the total height 69 ft. It is carried over the retort house by 75 ft. span girders, and is roofed and sheeted with asbestos corrugated sheets to meet the retort-house roof. This cover forms the housing for the telpher machine. For weighing the coal received by canal barge, a Blake-Denison non-stop automatic weigher is installed on the telpher track between the canal and the retort house.

The general details of the coal telpherage plant are shown on the plans and illustrations appended (see figs. 1, 3, and 4*).

The coal is delivered by the telpher machine into a receiving hopper which, in turn, is arranged to feed the push-plate conveyors supplying the overhead bunkers in the extended house, and in the existing house, as shown in fig. 3. The coal hoppers and telpher track in the old retort house are carried on cross girders supported by steel stanchions independently of the building; and in order to provide for the larger benches with five tiers of retorts, these girders are raised by means of lengthening the existing stanchions 10 ft., and will carry the new coal hoppers and telpher track in the reconstructed portion (see fig. 7).

The overhead hoppers have a capacity of 48 hours, and are fitted with "A. & G." automatic doors which enable the stoking machine to take its charge as it travels from one retort to the next (see figs. 6, 7, and 8). The stoking

* The illustration is too large for reproduction in the "JOURNAL."


TUBES SUFFICIENTLY LARGE TO INSPECT AND REPAIR UP THE INSIDE
THE WHOLE DEPTH OF HEATED BRICKWORK UTILISED FOR THE MORE EFFICIENT REGENERATION OF WASTE HEAT.
WASTE HEAT CONTROLLED FROM EACH 12 FT. LENGTH OF COMBUSTION CHAMBER.
12'0"
SPACES
ALL SILICA STAY WALLS WITH PATENT SILICA BRICK TO ABSORB EXPANSION
SOLID BONDED FRONT WALLS WITH EXTERNAL INSULATION
GASEOUS FUEL IN ALTERNATIVES SECONDARY AIR CONTROLLED BY ADJUSTABLE SLOTS OF COMBUSTION CHAMBER
8 SLOTS PER SETTING
3-8 FURNACE
10-3
CRS. OF BUCKSTAYS
95% SILICA SILT-UP BOTTOMS
ALL MATERIALS BROUGHT INTO VISIBILITY
KEYSTONE CANNON TO DISTRIBUTE PRESSURE EQUALLY ON ELLIPTICAL ENDS OF COMBUSTION CHAMBER, TO RESIST ALL EXPANSION THRUSTS.
SECONDARY AIR REGENERATOR
LARGE WASTE-HEAT TUBES

FIGS. 14 & 15.—DETAIL ELEVATION AND SECTION OF REGENERATOR SETTINGS.

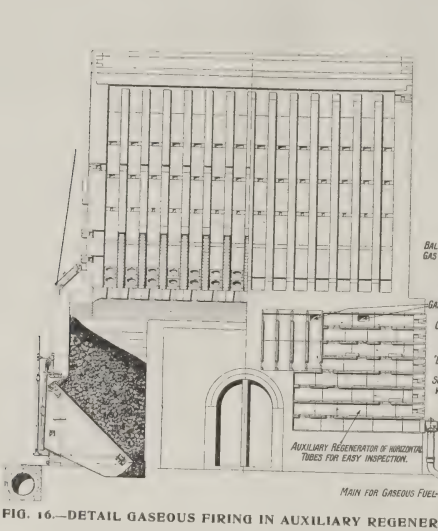

BALANCED, DOUBLY-SEALED GAS TIGHT CHARGING DOOR
GAS CONTROLLED INTO EACH ¼TH. OF LENGTH OF COMBUSTION CHAMBER.
'DEMPSTER-TOROIDO' NON-CLINKERING SCREEN-BAR GRATE WITH SLIDING DOOR.
AIR PORT CLOSED.
GAS VALVE OPEN.
AUXILIARY REGENERATOR OF HORIZONTAL TUBES FOR EASY INSPECTION.
MAIN FOR GASEOUS FUEL.

FIG. 16.—DETAIL GASEOUS FIRING IN AUXILIARY REGENERATOR.

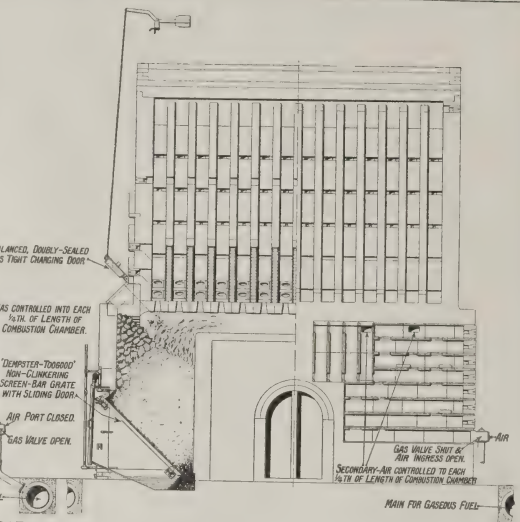

GAS VALVE SHUT & AIR INGRESS OPEN.
AIR
SECONDARY-AIR CONTROLLED TO EACH ¼TH. OF LENGTH OF COMBUSTION CHAMBER.
MAIN FOR GASEOUS FUEL.

FIG. 17.—DETAIL COKE FIRING IN AUXILIARY REGENERATOR.

is done by a Fiddes-Aldridge simultaneous stoking machine, which is of an improved standard type in that the driving blocks for conveying the power from the charging wheel to the chain are on the inside of the chain instead of on the outside, as was the case in the original "F.A." standard machine (see figs. 9 and 10). The result of this alteration is that it is possible to increase the width between the side plates of the chain, and obtain greater capacity of coal, and, consequently, a much heavier charge than was possible with the old type of chain. This is further assisted by the special push plates, which are made of a light heat-resisting alloy. The charges are even; and on the withdrawal of the chain are left with a slight depression caused by the trigger of the front push plate in the centre of the charge, which ensures free passage of the gas and also reduces the distance which the heat has to travel to the core of the charge in the process of carbonization (see fig. 11).

The main reason for adopting the simultaneous machine as against the projector type is ability of the former to deal with the finest slacks and dant, without the creation of nuisance. Further, it has an advantage in quicker operation. The weight of charge can, with silica retorts, be burnt-off in an 8-hour period with combustion chamber temperatures of 1325° to 1350° C. The author considers that the latter temperature can only be exceeded at the expense of the life of the settings.

The general arrangement of the new retort benches in the extension and in the old retort house is shown on the plan and elevation appended (see figs. 12 and 13).

The retort settings (see figs. 14, 15, 16, and 17) are built in semi-circular arches 8 ft. 9 in. span with 18-in. pier walls between the neighbouring hot portions of the setting, and 14 in. pier walls below stage-level, between the relatively cold regenerators. The special double regenerator disposed on either side of the waste-gas flues is cellular in construction. The tubes are staggered so that all joints are covered, in order to prevent leakage. Further, a two-ply thin partition divides the descending waste-heat flues and the ascending secondary-air or gas flues, as the case may be. The construction is such that any crack which might develop in one tube is opposed by the wall of the adjacent tube. The depth from stage floor to cellar is 12 ft.; and the whole of this is utilized for the regeneration of waste heat. The waste-heat, secondary-air, and gas flues are controlled into each quarter length of the combustion chamber. The waste-gas tubes are horizontal, for easy inspection, and are sufficiently large to be repaired from the inside. The gas regenerator, which is on the outside of the waste-gas tubes, is similarly ar-

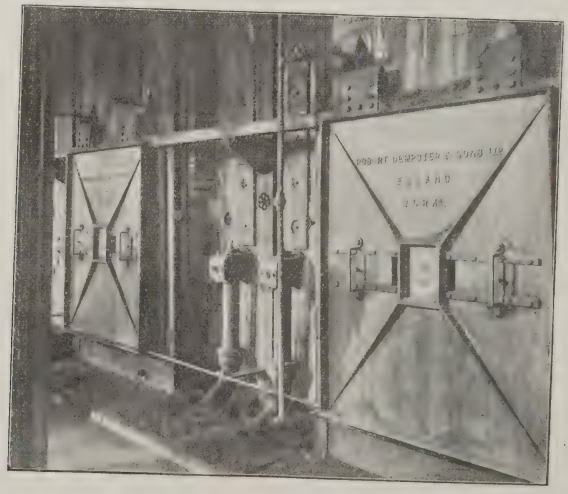


FIG. 18.—FURNACE DOORS.

ranged. The gaseous fuel or secondary air, as the case may be, is carried across the top of the waste-gas tubes, in cross ducts, to a large distribution chamber feeding the nostrils. The tubes in the secondary-air regenerator are arranged vertically, and the nostrils of both gas and air regenerators are brought into visibility in the combustion chamber.

The design of the producer is a good one; the furnace being 3 ft. 9 in. wide by 5 ft. 4 in. back to front with a fuel depth of 7 ft. In the author's opinion it is important, to procure the most economic working and even gasification, that the furnace should be as nearly square as possible. Much higher producer efficiency can be obtained with a wide furnace than with the long narrow shape which was the general practice for so many years.

The furnaces are fitted with non-clinkering adjustable screen-bar grates, and have a grate area of 26·25 sq. ft.,

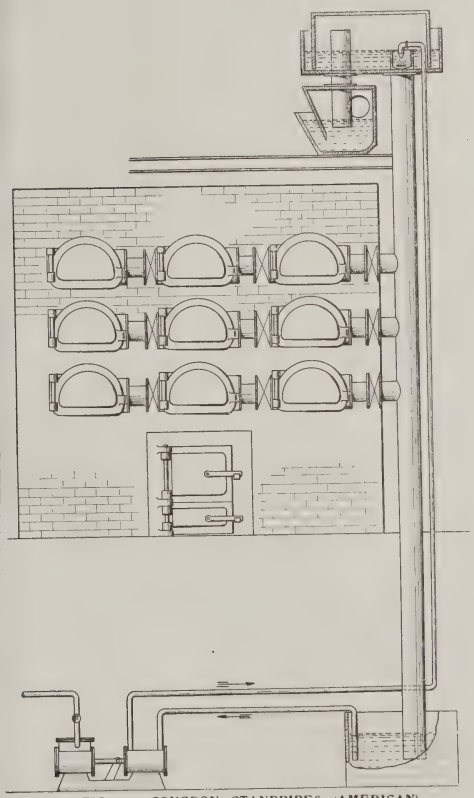


FIG. 19.—CONGDON STANDPIPES (AMERICAN).

2·39 sq. ft. per 20 ft. of retort. This form of grate obviates the necessity for clinkering, and facilitates an even rate of gasification; the whole grate area being maintained in a lively condition, as the air has ready access to the entire grate. Moreover, there is no dead fire resting upon the ash-pan itself. Provision is made for working the producers with steam or water; and at this point it may be mentioned that most satisfactory results have been obtained so far by the former method with almost dry ashpans. The charging doors are of the "Elland" double-sealed gas-tight type; the lids having an annulus which, with the door closed, forms, with the metal sealing face of the frame, a dust-retaining cavity completely surrounding the door, into which cavity dust and breeze swept from the retort-house floor is thrown. The sealing face is steeply inclined, so that the dust, on opening the door, falls away into the fire. The lids are hinged and operated on the Becton balanced lid principle, with counter-balance weights at the top of the bench (see figs. 16 and 17). The sliding ashpan doors of the producers are suspended from an overhead rail on a travelling bogey; and the door frames are flanged so that the machined faces of the frames and doors can be clamped to secure absolute tightness (see fig. 18).

The retorts, which are ⌂ section, 24 in. by 18 in. by 22 ft. long, are built up in 95 p.ct. silica segments, and are set in five tiers supported by thirteen all-silica stay walls 6 in. thick, with patent elliptical combustion-chamber arches in which the keystone is common to the producer arch and to the combustion-chamber arch. This prevents the lifting of the producer-gas arch by unbalanced expansion strains. The flues between the stay walls are 11¼ in. wide, so that, practically speaking, the very high proportion of 60 p.ct. of the retort is exposed for economic heat transmission—and this without sacrifice of strength. The stay walls are built with a saw-tooth edge construction where they abut on the pier walls, and between the retorts, to provide for after-expansion of the silica material (see fig. 14). The double provision for expansion at the point of highest temperature—*i.e.*, between the top three tiers of retorts—with the saw-tooth joints amounts to 2 in. It is interesting to note that, from observations on the heating-up of the settings, these joints have closed, as near as can be estimated, to ⅛-in.

For the purpose of firing the setting with coal gas, or producer gas from external producers, an 18-in. diameter gas main is carried beneath the cellar floor on both sides of the retort bench, and is connected to the auxiliary regenerators on each side by two 4-in. connections provided with a specially-designed gas valve for regulating the supply of gas to the setting (see figs. 16 and 18). The front walls of the settings and top of the retort bench are insulated with 4½-in. thickness of porous insulating bricks.

It will be observed from the foregoing description and a perusal of the diagrams that the setting meets all the requirements of modern practice as is generally accepted for efficient horizontal retorting with self-contained producers. With regard to the operation of gaseous firing with gas from external sources, it is proposed that the setting shou'd be first started-up under coke firing, and then changed on to gaseous firing either by coal gas or producer gas. It is desirable, of course, to close-off the producer; and the most simple manner of doing this is to charge the fire with a layer of breeze, which, after the closing of the primary air openings, will smoulder away, leaving the furnace fully ashed up. Alternatively sand or brickdust may be thrown on the surface. When passing back to coke firing, this can easily be broken-up. This procedure is only suggested as an additional precaution beyond the closing of the primary air openings, and the sealing of the furnace door. When the setting is being coke fired, the auxiliary regenerator is used for pre-heating the secondary air, which is admitted above the gas valve by means of a special port in the body of the valve above the seating. (See figs. 16 and 17.)

A departure has been made from standard practice in this country by the adoption of Congdon scrubber standpipes in place of ascension pipes and hydraulic mains. It has previously been mentioned that the existing condensing, washing, and scrubbing plant was sufficient only for the maximum make of gas in 1922; and it was considered that the adoption of the scrubber standpipe would assist in reducing the work on the purification plant.

The design of the standpipes as originally used in America (see fig. 19) was not, in the writer's opinion, such as would give efficient scrubbing or equal conditions as to pressure on all retorts; the pipe being of the same area throughout its length, though the volume of gas at the top is very much greater than at the bottom. The scrubbing effect on the gas from the top retorts must, in these circumstances, be very small.

A further objection to American practice was that the standpipes are reduced in area at the bottom, and connected to a tar pipe which conveys the tar and liquor to seal pots located in the cellar below the stage-floor, with possibility of stoppages arising in the down-take pipes, should any deposited pitch or carbon be forced through into the standpipes when cleaning the outlets from the mouthpieces. Moreover, the down-take pipes and seal pots prevent free access to the regenerator flues, and the seal pots themselves are not under the direct observation of the stokers on the stage-floor of the house.

After careful investigation, it appeared that the neces-

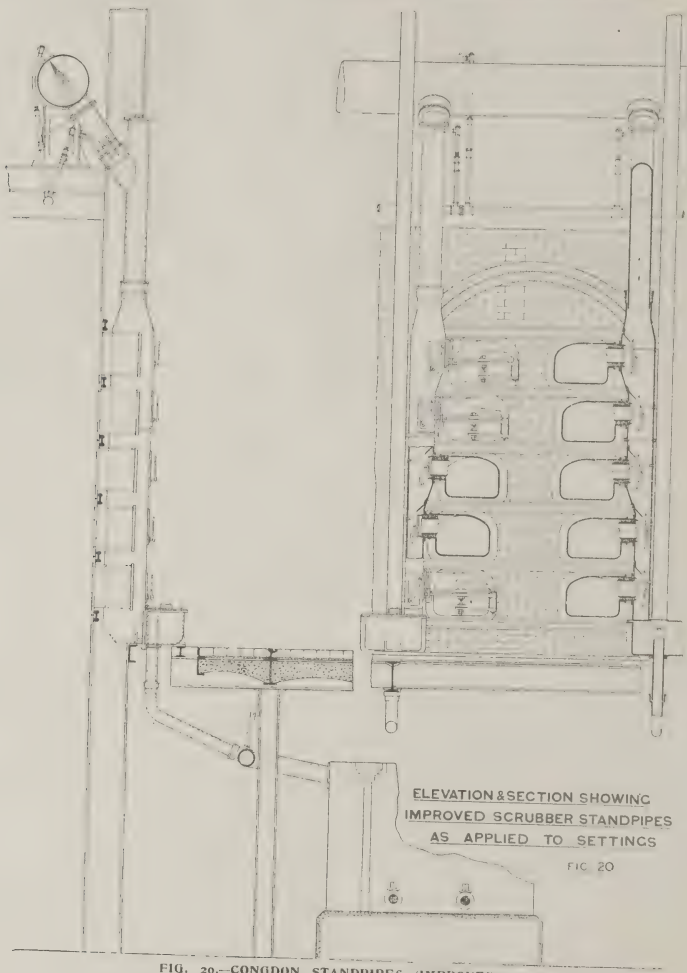


FIG. 20.—CONGDON STANDPIPES (IMPROVED).

sary conditions for the success of the scrubber standpipes were:

1. The area of the standpipe should increase in proportion to the volume of gas passing, to ensure maximum scrubbing effect and maintenance of equal pressure on all retorts.
2. The seal box to be at stage-floor level, the bottom of the standpipe forming a part of the seal box with direct access under the dip plate, should any foreign matter or pitch accumulate at the bottom of the standpipe.
3. Direct observation of the tar and liquor overflow from the seal boxes, which should be provided with tight covers easily removable.
4. The tar and liquor pipes connecting the separating tanks with the seal pots at stage-floor level should be arranged to avoid interference with access to the regenerator flues.
5. The standpipes to be suspended in such a manner as to allow free movement on the expansion of the setting taking place.
6. Connections between the mouthpieces and standpipes to be as short as possible, and allow movement, vertically and horizontally, to the extent of maximum expansion.
7. Provision to be made for quickly isolating any standpipe when required.
8. Operating valves for shutting-off retorts to be easily removable for inspection.
9. Connections between standpipes and foul mains to be of large area, and provided with expansion joints.
10. Liquor sprays to be arranged suitably, for easy cleaning and inspection.

An improved scrubber standpipe (see figs. 20, 21, and 22) was designed on the basis of these desiderata. The standpipe is increased in area by two steps; the maximum area being opposite the top retort. At this point it might be mentioned that, on the eighteen beds now under construction in the existing retort house, it is proposed to carry up the standpipe to a greater height above the top retort, with baffle plates to disperse the liquor and increase the scrubbing capacity (see fig. 23).

The seal boxes are made D shape; two standpipes being connected to each seal box, the bottom of the pipes being level with the bottom of the seal boxes. The dip plates at the front of the standpipes are arranged to give a seal of 6 in. The 4-in. overflow pipe is provided with a notched weir for measuring the rate of flow of the liquor from the standpipes. Easily removed covers are fitted to the seal pots, for inspection purposes, and for cleaning out when required.

The standpipes themselves are of cast iron in two castings. The bottom casting receives the connections from the three bottom tiers of retorts, and is formed to connect-up with the seal box. The top casting receives the connections from the top two tiers of retorts, and at the top is formed into a socket to receive the 9-in. diameter

connecting pipe to the foul main. The standpipes are 1 ft. 6 in. from back to front for the full height, $7\frac{1}{8}$ in. wide to the height of the second tier, $11\frac{1}{8}$ in. to the height of the fourth tier, and $15\frac{1}{8}$ in. wide at the fifth tier. The connections between the standpipes and the mouthpieces are 7-in. diameter, and are taken-off from the side of, and at right angles to, the mouthpiece; the distance between the inside of the mouthpiece and the face of the valve in the standpipe being $7\frac{3}{4}$ in. Socket pieces, which form a V-shaped valve seating on the inside, and $2\frac{3}{4}$-in. socket externally, are bolted to the standpipe; and the connection between this socket and the mouthpiece socket is made by a special sleeve, the external portion of which is ground to spherical radii struck from the axis of the sleeve at the centre of each socket, so as to permit free movement of the sleeve in any direction in its own packings when expansion is taking place (see fig. 20).

The valves, which consist of plain cast-iron spherical discs hinged to bell-crank levers, are designed for easy removal. The stuffing-box bearing mounting the axle to which the operating lever is connected is contained in a detachable plate bolted to the front of the standpipe; and the plate, with the valve attached, can be withdrawn by removing the set-screws securing the plate to the standpipe (see fig. 20). Inside the standpipes, immediately above each valve, deflection plates are provided set at an angle to the vertical side of the pipe, to deflect the liquor on to the face of the valve when open, to ensure: First, that the gas passing from the mouthpieces will meet a stream of liquor; and secondly, to assist in keeping the faces of the valves clean. A further object of these deflection plates is to prevent liquor travelling round the face of the valves, and so into the mouthpieces.

The standpipes are suspended from brackets attached to the front buckstays by hanging bolts, so as to permit of forward movement, on expansion taking place, independently of buckstays (see fig. 21). The 9-in. pipe connection to the foul main is carried vertically for a height of 4 ft. above the stand pipes, where a branch is taken-off at an angle of 36°, connecting into the bottom of the foul main. On this branch pipe there is a socket with special provision for expansion. There is also a faced joint immediately above the socket, in which an isolating disc can be simply inserted by the slackening of two bolts. A 24-in. foul main, to the bottom of which the standpipes are directly connected, runs the full length of the bench; the drainage of this main being through the standpipes themselves. The off-take from this main is at the centre of each bench, to ensure equal conditions as to pressure on all standpipes. Each bench of retorts is controlled by a 14-in. Cowan retort-house governor, and, in addition, Peebles' safety relief governors are fixed on each foul main at the centre of the bench, to provide relief in case of accidental stoppage of the exhausters. Liquor sprays are provided, one on each standpipe (see fig. 24), with two additional ones in the foul main itself. These sprays are specially designed with the spray box external to the pipe; liquor being fed to an annular chamber, and then direct to the spray nozzle. By shutting-off the liquor from the pipe supplying the annular chamber, and opening a cock at the back of the spray box, direct access is given for cleaning. The sprays are easily accessible from the platform running on the top of the bench at the back of the foul main (see figs. 25 and 26).

The 4-in. connections from the seal pots are connected to tar and liquor separating tanks set opposite the centre of each bench, by means of 6-in. tar and liquor mains provided with large inspection covers, for cleaning purposes.

FIG. 21.—CONGDON STANDPIPE, SEAL POT, VALVE PLATES AND LEVER.

FIG. 22.—RETORT BENCH, CHARGING SIDE.

The 4-in. downtake pipes are immediately opposite the buckstays, and, therefore, do not in any way interfere with access to the regenerator flues.

The tar and liquor separating tanks are 17 ft. 6 in. long, 8 ft. wide, and 5 ft. 6 in. deep, divided into three chambers with baffle plates in each. It has been found since the plant started working that these are of ample capacity to ensure complete separation of the tar and liquor; no tar being found in the last, or liquor, suction chamber. Liquor pumps are provided in duplicate for pumping the liquor over the standpipes; and as the cellar floor is below ground-level, tar pumps are also provided for pumping to the wells the tar run-off daily from the separating tanks.

The scheme provides for two waste-heat boilers. The first boiler is situated at the end of the new extension, and is of sufficient capacity to deal with the waste gases from nine settings. The boiler is of the Spencer-Bonecourt "Kirke" patent type, 8 ft. in diameter by 17 ft. tube length, suitable for a working pressure of 100 lbs. per sq.in., with a superheater capable of giving a superheat of 100° Fahr. A second and larger waste-heat boiler is to be installed of sufficient capacity to deal with waste gas from the sixteen settings in course of construction in the existing retort house. The main flues of all three benches

are inter-connected, and provided with dampers, so that by the operation of these dampers it will be possible to work the waste-heat boilers at their maximum capacity at all times. This was considered to be desirable, as it is the ultimate intention to utilize the waste-heat boilers for the generation of electricity for the whole of the power to the works.

Provision is made in the scheme for two external producers for the gasification of coke breeze or cheap slack, each having a capacity of 12,750,000 B.Th.U. of gas per hour, which will be sufficient for the heating of twelve settings. The producers are to be erected beneath the extension of the coal telpher; and the overhead coal bunkers supplying slack or coke breeze to the producers are to be fed by the telpher machine grab.

On the discharging side of the house an electrically-operated coke bus (see figs. 6 and 27) is provided for feeding coke direct to furnaces or to telpher skips from the top tiers of retorts, whereby labour is saved and breeze formation prevented. The coke is removed from the house by a high-speed telpher machine on to an external quenching bench provided with sliding doors for the discharge of the coke, after quenching, into a receiving hopper feeding a coke breaker and elevator, whence it is taken to overhead screens and storage bunkers. Provision is also made

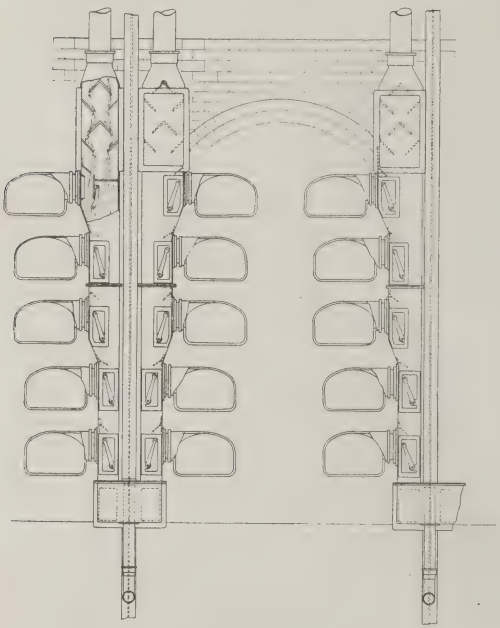


FIG. 23.—DETAILS OF IMPROVED CONGDON STANDPIPE.

for a quenching tank fitted with hinged doors at ground-level at the gable end of the house. These doors are closed by the weight of the skip and opened by counter-weights; the doors being arranged to close before the skip actually touches the water in the tank. A special steam duct from the tank carries the steam away above the level of the retort house. This arrangement is designed to prevent nuisance from the diffusion of steam and coke breeze which arises when quenching is carried out in an open tank.

The telpher track is carried round the coke storage yard to form a continuous loop, so that the telpher machines will travel in one direction only when in operation (see fig. 1). It may be mentioned as a point of interest that the existing coke telpher track has been utilized as far as possible; the foundations of the trestles being increased in height to raise the track to the new level.

A retriever pan-ash washer is installed on the discharging side of the retort house extension, the elevator supplying the washer being carried from cellar floor level. The apparatus is also arranged for feeding from ground level for the purpose of breeze washing.

The stage-floor in the retort house is carried separately from the bench, so that no expansion can be transmitted to the house framing; and chequered plates over the intervening space between the floor and the bench are constructed in a manner to allow an air space to assist ventilation beneath the floors.

The retort house extension containing the first new bench of nine settings is a steel-framed building filled with 9-in. and 4½-in. brick panels. The chequered brickwork panels for ventilation on the sides and gable end are arranged as lettering to form, at the sides, an advertisement reading "Use Gas and Coke," and, at the gable end, "Use Gas." (See fig. 4.)

Construction.

The foundations for the whole of the plant were laid down by the undertaking, employing direct labour. The subsoil is loam and sand to a depth of 6 ft., when a water-bearing gravel bed of 7 ft. thickness is reached. This overlies a stratum of blue clay, which, it is presumed, in turn overlies the red sandstone formation. The depth of this latter has not been proved on the site.

It was not possible to take the foundations down to the clay, on account of the cost; and it was decided to construct the bench foundation as a reinforced concrete raft above the gravel bed—the main bearing points of the raft being the stanchion bases, and the pier walls of the retort bench. Grip steel bar reinforcement was utilized; and fabric reinforcement in flat sheets covers the whole of the bottom of the foundation, in order to disperse over the whole area the portion of the load distributed between the 18-in. pier walls of the bench. Distribution of the load from the end and side stanchions and 18-in. piers is ensured by continuous beam reinforcement alternating from the top to the bottom of the foundation, according as the bending moment is positive or negative. Particular attention was paid to the ash-pan pockets, which were specially reinforced with ⅝-in. stirrup rods, to distribute the load. In no case does the whole of the loading on the ground exceed two tons per sq.ft. The average thickness of the concrete foundation is 2 ft.; and by the method of reinforcement adopted, greater strength is obtained than could have been secured by massed concrete, and at much less cost. The pipe trenches formed in the foundation to receive the gas mains for the supply of fuel gas to the settings have special fabric reinforcement.

The erection of the new benches in the existing house required the deepening of the cellar floor to the extent of 4 ft., to provide for the deeper settings; and this necessitated the breaking-up of the existing massed-concrete foundations, 4 ft. in thickness. For this purpose hydraulic cartridges were used; the method of operation being to drill a hole 5 in. in diameter in the concrete, and insert a hydraulic cartridge, which consists of a steel cylinder, 18. long, containing four plungers which can be expanded 2½ in. from the circumference of the cartridge. The cartridge is wedged in the hole by steel wedges driven in front of the plungers, which are extended by hydraulic pressure supplied by hand through a screw pump until a fracture in the bed of concrete is made. The maximum pressure exerted by one cartridge is 400 tons.

The large blocks of concrete were afterwards broken-up by means of pneumatic picks operated by compressed air. The cost of demolishing the concrete foundations by this means worked out at 22s. 6d. per c.yd.

The contract for the whole of the work, with the exception of foundations, stoking machine, and improved Congdon standpipes, which were supplied by Messrs. Aldridge & Ranken, Ltd., of Bath, was let to Messrs. Robert Dempster & Sons, Ltd., Rose Mount Iron Works, Elland, on March 19, 1924. The work on the foundations for the retort-house extension was commenced on March 20, 1924; and these were completed ready for the contractors in the space of twelve weeks.

The steelwork framing of the retort house, stage floors, stanchions, and retort-bench bracing, amounting in weight to 220 tons, was erected complete in 57 working days. The whole of the work on the extension, including the building of the retort benches and construction of the steelwork telpher track superimposed on the reinforced con-

FIG. 5.—ACCESS PLATFORM.

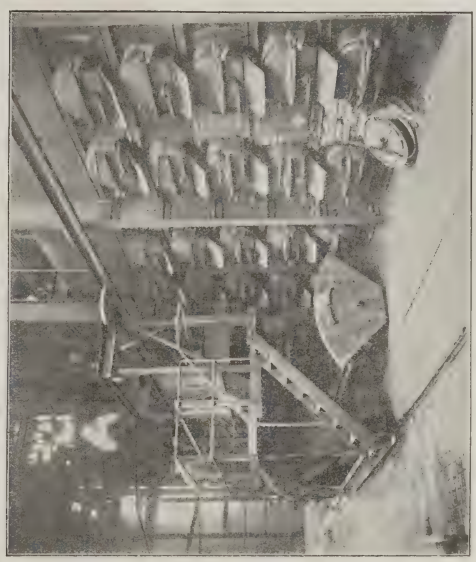


FIG. 27.—COKE BUS (DISCHARGING SIDE.)

FIG. 24.—LIQUOR SPRAYS AND STANDPIPE.

FIG. 26.—TOP OF RETORT BENCH.

crete telpher track between the canal and the grab pit, was completed by Nov. 26, 1924, and gas-making was commenced on the new plant on Jan. 10 of this year. The difficulties of construction were accentuated by the fact that the existing retort benches had to be worked to their maximum capacity until the extension of the house was completed.

WORKING RESULTS.

The first new bench of nine settings has been in operation for a period of four months; and some interesting data have been obtained of the working results. The settings have so far only been worked with their own producers, as it has not been possible to attempt coal-gas firing, owing to the reconstruction in progress and sufficient plant not being available. Further, the external producers have not yet been erected. The results, however, prove that the setting working with its own producer is highly efficient.

The following figures are the result of a six days' experimental run :

Duration of charges	12 hours
Coal carbonized	710·4 tons
Gas made	9,896,000 c.ft.
Make per ton (corrected)	14,360 c.ft.
Average calorific value	529 B.Th.U.
Therms per ton	75·96
Coke made	497 tons 6 cwt.
Coke used on producers	70 tons 19 cwt.
Coke available for sale per ton of coal carbonized	12 cwt.
Coke consumed on producers per ton of coal carbonized	2 cwt.

The average analysis of gas made during the period of test is as follows :

	P.Ct.
CO_2	3·4
O_2	0·4
C_nH_m	2·0
CO	10·0
CH_4	26·3
H_2	51·0
N_2	6·9

Average total inerts, 10·7 p.ct.

The coals used were a mixture of slacks, all under 1 in. screened size, drawn from Lancashire and Yorkshire seams; the proximate analysis being as follows:

	P.Ct.
Moisture	3·3
Organic volatile matter	30·0
Ash	11·0
Fixed carbon	55·7
Total	100·0

The average coke consumption on producers is 10 lbs. of coke per 100 lbs. of coal carbonized. The coke produced was of good-grade quality of fine-close to medium-close structure, and hard; the average ash content being 15·3 p.ct. The heat balance on the basis of the above trial shows a net efficiency of carbonization of 82·04 p.ct.

Careful observations were taken over a period of eight weeks, to ascertain the heating efficiency of the settings; readings being taken with a Siemens optical pyrometer. During this period the settings were on 12-hour carbonizing, operated in two 8-hour shifts, and 4-hour periods between charging. The normal weight of charge was 16 cwt.; and with regard to this item, it should be pointed out that a large portion of the coal used consisted of washed fine slack, which does not flow so easily through the hoppers and stoking machine as dry slack. When working on the latter, an average charge of 17 cwt. can be maintained.

The average temperatures maintained in the combustion chambers on the nine settings throughout the period of eight weeks are as follows:

	Average Temperature, °C.
Setting No. 1	1253
,, No. 2	1287
,, No. 3	1285
,, No. 4	1286
,, No. 5	1295
,, No. 6	1293
,, No. 7	1296
,, No. 8	1301
,, No. 9	1278

These temperatures are not high, but were more than sufficient to ensure complete carbonization within the period of twelve hours.

To ascertain the temperature gradient within the settings, daily readings were taken at various points, of which the following is a summary:

Points where Readings were Taken.

A. . . . . Combustion chamber.
B. . . . . Top of the settings, at a point where the gases divide above the top tiers of retorts.
C. and D. . . Left and right sight holes under bottom tier of retorts above waste-gas flue.
E. . . . . Temperature of waste gases in the main flue.

—	A.	B.	C.	D.	E.
Max., °C.	1370	1017	955	940	620
Min., °C.	1230	940	815	847	460
Average, °C.	1302	988	900	905	538

These figures are interesting in that they show that the balance of heat throughout the settings is well maintained. The average CO_2 content of the waste gases is 16 p.ct. There is a slight excess of oxygen; but this does not reach 1 p.ct. These figures substantiate the good fuel results obtained. The producers work without need of clinkering, and easily maintain the temperatures with the combustion chambers under pressure.

The standpipes have so far proved most satisfactory in operation. The provision made to meet expansion proved to be adequate; and though in some instances the forward movement of the front wall of the settings, due to expansion, was as much as $\frac{3}{4}$ in. horizontally and 7-16 in. vertically, in the case of the top retorts, this was easily met by means of the suspension adopted and the spherical sleeve connections between the mouthpiece and standpipe sockets. When opened up for examination, the standpipes showed a slight film of tar about $\frac{1}{32}$ in. thick covering the sides and valves.

Equal conditions as to pressure are easily maintainable on all retorts; the retort-house governor being worked with approximately $\frac{1}{10}$ in. vacuum on the inlet. On opening the valves when charging, it is observed that the gas is practically in a state of equilibrium. The pressure maintained on the delivery side of the liquor pump is 10 lbs. per sq.in.; and the liquor is delivered through the sprays to each standpipe at the rate of 5 gallons per minute. There is an automatic relief valve on the liquor delivery pipe, returning the excess liquor to the separating tank.

Daily observations of the temperature of the liquor in the standpipe seal pots and outlet of the separating tank have been taken at 10 a.m. and 4 p.m.; and in this connection it should be pointed out that the shift hours when charging takes place are from 10 a.m. to 6 p.m., day and night shifts.

The following are the average temperatures over a period of eight weeks:

—	Time.	Max.	Min.	Average.
		°Fahr.	°Fahr.	°Fahr.
Seal pots	10 a.m.	191	151	181
	4 p.m.	199	181	190
Tank	10 a.m.	170	154	163
	4 p.m.	183	168	178

The cooling of the liquor in its passage through the separating tank varies on the average from 18° Fahr. at the commencement of the charging period to 12° Fahr. at the end. The average temperature of the gas leaving the standpipes is 179° Fahr. at the commencement and 199° Fahr. at the end of the charging period.

It will be observed that the difference between the gas and liquor temperature is only 16° to 21° Fahr. It is noticeable, however, that even with this difference a considerable amount of shock cooling and scrubbing effect is obtained. During the trial run of six days, previously referred to, the tar drawn from the settling tank was measured, and was found to be equivalent to 49·04 lbs. per ton of coal carbonized.

The loss by evaporation is made up by the constant addition of fresh water to the separating tank, and the ammonia content of the liquor in circulation remains at a constant strength averaging 11·6 ozs. The distribution of ammonia as between fixed and free is as follows:

Fixed	11·2 ozs.
Free	0·4 ozs.

This is easily accounted for when temperature conditions are taken into account. The fixed ammonium salts contained in the liquor are largely ammonium thiocyanate; and the action between sulphuretted hydrogen and hydrocyanic acid is continually adding to the content of this compound. Sulphurous acid, sulphuric acid, and thiosulphuric acid are present only in very small proportions.

The work on scrubbers and washers has been greatly relieved; and it has been found that a large percentage of the free ammonia is brought down in the condensers.

With regard to the effect of the standpipe system on the sulphur content, the following figures are of interest:

April, 1924.	Average H_2S content on the inlet of purifiers	749 grs. per 100 c.ft.
April, 1925.	Average H_2S content on the inlet of purifiers	594 .. .. ..

The average decrease was 155 grains per 100 c.ft., or 20·7 p.ct. on the 1924 figures. The same class of coals were carbonized in both periods; the average sulphur content being 2·55 p.ct. on dry coal basis.

It is interesting to observe that in the old retort house there were two ascension pipes per retort, whereas the standpipes are on one side of the new bench only. Previous experience has been that H_2S in gas from horizontal retorts with one ascension pipe is higher than two. The lower sulphur content with the standpipes is doubtless due to the effect of ammonia washing.

The period of operation of the plant has not been sufficiently long to permit of the collection of accurate data with respect to the yield of the liquid products; and in giving the foregoing results, the author has confined himself specially to the results bearing most directly on the new features which it has so far been possible to record.

Discussion.

The President: We have heard a most instructive engineering paper on carbonizing and the reconstruction of a gas-works. I have had the privilege of seeing these works, not since they were completed, but during the time they were in progress; and I can only say that Mr. Carr is to be congratulated on being able to take a plant which required considerable modification and utilize it so as largely to increase the output. He has had a difficult task at Stretford, because, as you have heard,

Stretford is an intensely industrial area, and the increase in the demand for gas was very considerable. Therefore Mr. Carr is to be congratulated on being able to reconstruct these works, and also supply a greatly increased demand. You all remember that his father, Mr. Isaac Carr, was noted as being the one who supplied the cheapest gas in the world. I venture to say that Mr. W. M. Carr is following in the footsteps of his father. The figures he has given us show the efficiency of the plant that he has introduced, and he has also adopted some very novel methods with reference to carbonizing. I am sure there is a fund of matter in the paper which would probably take us a day if we were to discuss it adequately; but I should like one or two of those present to enter into the discussion. Any questions that you may care to put, I am sure Mr. Carr will be pleased to answer. As Mr. Toogood has been mentioned in connection with the plant, perhaps he will say a word or two.

Mr. H. J. TOOGOOD: As a visitor, I appreciate very highly the permission to say a few words in connection with this contribution. First of all, I must congratulate Mr. Carr upon a very splendid paper. It is crowded with most interesting facts. As many of you will be aware, the chief reason for my connection with the Stretford installation is that Mr. Carr, when he selected his scheme of carbonization, elected to place his order with the firm of Messrs. Robert Dempster & Sons, whom it has been my privilege and pleasure to serve for the past 21 years. During this long association it has been my lot to be connected with various forms of carbonization. So that there shall be no misunderstanding, I would just like to say that in 1904 I was chiefly engaged on stoking machinery; in 1908 I was engaged on intermittent vertical retorts; in 1911, with continuous retorts; and now I stand on the platform with horizontal retorts. But I do not want you to think that there has been any variaion whatsoever, inasmuch as the consistent theme running through the whole of that experience is the development of the machinery of carbonization; and it is under the head of the development of the machinery of carbonization that I venture to discuss Mr. Carr's paper. As Mr. Carr has headed his paper "Selection, Design, and Construction of New Carbonizing Plant at Stretford," I venture the opinion that the lesson of this paper will be remembered for many years as "cheap gas, and how to get it *via* residuals." As an example of this, I would mention Mr. Carr's father, Mr. Isaac Carr, whose name is brought to mind by the very mention of the words cheap gas. The author of this paper has, metaphorically speaking, been reared in an atmosphere of cheap gas; and he will therefore be a champion, second to none, of cheap gas.

In reading the paper, one is struck by the bed-rock principle which underlies the whole of the reasoning—viz., to keep the net cost of coal as low as possible. Consequently the lay-out of the works is really very unique. Mr. Carr did not mention destruction in the title of the paper; but in order to get the plant of his heart's desire, he has had to destroy a considerable amount of good work. Now you will see the theme. He has had to get a retort house wedged between the railway and the canal; so that the widest possible fields for the purchase of cheap coal are, as it were, brought to the door of his retort house. The actual plant is described at length in the paper; but I would like to express it from my own point of view. He has chosen a 70 ft. high-level telpher; and the arrangements are such that he can check the coal from the canal or from the railway or from stock. Though he may have coal from a hundred sources, and cheap coal, the mixture that gets into the retorts is a desirable blend, and he gets coke which is consistently good for his Stretford coke market. Under this head, I suggest that Mr. Carr's paper is quite eligible for the Coke Competition organized by the Editor of the "GAS JOURNAL." Mr. Carr has explained the difficulties at Stretford when this plant was being considered, the chief of which was that the plant must be working for the winter. Therefore, there was very little time to design it. Moreover, the coal to be carbonized was slack; and as the plant had to be working for the winter, Mr. Carr laid it down that there must be nothing of an experimental nature. Nevertheless, the Stretford coke market was always in evidence as being a primary feature in the production of cheap gas; and therefore it was realized that, if the net cost of coal could ever be brought down to nothing, then many economic factors in gas manufacture would be turned topsy-turvy. It was to seize upon this opportunity that Mr. Carr decided to go forward with optional gaseous firing.

Being partly responsible for the design of a portion of this new setting, I would, with your permission, just like to run through its salient features. With regard to the retorts, these have been designed to carbonize slack which is sometimes wet and sometimes dry; but there is always a heavy charge to be carbonized in regular time periods. It was expected that we should have to go to higher temperatures of carbonization; and therefore 95 p.ct. silica retorts were adopted. That these retorts are gas-tight, and that they do their work well, is borne out by the 75 therms per ton of slack with a 10 lb. fuel consumption. The side walls of the retorts were likewise 95 p.ct. silica bricks; the idea being that the retorts would live when the expansion of the silica gave, so to speak, an even keel, so that the gas-tight qualities of the retort should not be disturbed. A space of 2½ in. was allowed on the top of the wall under the crown of the arch on account of this upward expansion; and this space has been virtually absorbed, thus bringing out a fact, never known before, that silica structures expand considerably more than does a solid silica brick when tested in a muffle in a laboratory. To absorb the side expansion of silica walls is much more difficult, as it must be absorbed within the one arch of the setting. Otherwise it would be cumulative down the side, and consequently, in long settings, would be disastrous. To prevent this, the side walls were saw-toothed or staggered. This prevented any squat and consequent leak. No timber was used, for the simple reason that timber burns away at one period; and therefore, since silica expands over a long period, it was felt that timber would leave a space, and a space within a structure like a setting, to say the least, is an unknown quantity, which we were better without. As regards heat transmission, Mr. Carr has said that the walls are 6 in. thick, and the flues 11 in. wide. This means that 60 p.ct. of the retorts are exposed to rapid heat transmission, which has turned out to be effective by the very low fuel consumption. As regards the producer, we believe that the producer is the driving force of any setting, and therefore too much attention cannot be given to its design. But we had a narrow arch with which to work, and we had to put in extra regeneration; yet we wanted a large producer. By scheming the regenerators and utilizing the full depth of the solid brickwork, some 12 ft., we were enabled to get in a producer of 26 sq. ft. area. The grate for this producer was on the screen-bar principle, which has not been in evidence for more than three years. To those who have had no experience of how this type works, it will come as a revelation to witness it in operation. With a smooth, steep perforated screen, such as in the screen-bar grate, the coke slips completely down; whereas with a step grate the coke tends to rise at every step. With a screen-bar grate, the coke continually creeps downwards, while the ash gravitates from the pan. With regard to the regenerators, for the purpose of fuel consumption you cannot have regenerators too large; but here, as I have said, we had only a small space, and therefore the settings consist of a nest of tubes. There are no flues other than tubes. The waste heat descends the centre row. Each of the tubes in the centre row opens to the outside wall; consequently, each being 12 in. by 9 in., you can examine it and clean it and repair it. The secondary air on coke firing passes up through the outside pairs of tubes. The excess air passes up the second pair, and the excess fuel to be preheated passes up the tubes near the walls. These tubes form a very thin division between the waste heat and the secondary air, and consequently are economical in heat transmission, and yet give a double safeguard to preserve efficiency.

Mr. H. H. COLLETT (Sheffield): I heartily congratulate the author on having given us a paper which contains a tremendous amount of food for thought; and I am sure we shall all study it at our leisure, because it is a little difficult to discuss it off-hand. We can then adopt his principles if we are so inclined, because a great amount of ingenuity has been displayed. With regard to the silica retorts, I should like to know whether they are made of 95 p.ct. silica throughout—*i.e.*, whether both the arch and the floor are of 95 p.ct. silica. Then with regard to the liquor circulation. I take it, from what Mr. Carr says, that the liquor which comes from the Congdon standpipes flows down into a tank, and is pumped over again. The temperature of that liquor is very high, and I should like to ask if there has been any trouble with this high temperature. I remember in Leeds we circulated liquor in a similar manner, and got a result, on analysis, very similar to that of the author. It was very high in fixed ammonia and low in free ammonia; but we certainly had trouble with the wrought-iron pipes through which the liquor was sent, and considerable trouble with the pumps. The piston rods had to be renewed fairly frequently, owing to the very corrosive effect of this liquor, which was high in chlorine. I must join issue with Mr. Carr with regard to the quenching of the coke. From my experience, I do think that quenching coke in telpher skips by dumping it into tanks is a bad thing; and I am sorry that Mr. Carr has adopted what I should regard as a retrograde step. Personally, I think the quenching of coke can be very much better done in front of the retort benches by means of hoses. We do that in Sheffield. It is very satisfactory, and we are very seldom troubled with coke fires. In fact, during the whole of last winter, we did not have a single coke fire or the suspicion of one on the heap. I am very pleased to see Mr. Carr speaks so highly of the Congdon standpipe, particularly as I have heard not very good reports of it. Mr. Carr has given us a good report, and no doubt this is due to the modifications which he has so ingeniously applied to it. There is just one other question. What gas is Mr. Carr supplying in his district? Is he supplying a straight 520 B.Th.U. gas, or is he diluting it with water gas? That is an interesting point I should like to be clear upon.

Mr. W. B. LEECH (Gas Light and Coke Company): As one of the judges in the Coke Competition, I would like to warn Mr. Carr that he is already disqualified. [Laughter.] I should like, however, to add my thanks to him for this excellent paper, because I am sure it will be appreciated by all the members, and especially those engineers who are contemplating extensions to their carbonizing plant. The selection of new carbonizing plant is always a difficult problem, each type having so many points in its favour; and certainly I have always found it a very difficult thing to arrive at a really satisfying decision. Mr.

Carr seems to have threshed the matter out, and certainly from his paper I am obliged to agree with him that horizontal retorts are better than any other type for his particular purpose. In fact, I am very much in agreement with him all through, with the exception of one or two small matters. Perhaps I might mention the section of the retorts. I notice Mr. Carr has gone in for 24 in. by 18 in. We have had rather long experience of this type at Beckton, but have found they are rather on the large size for our class of coke. We have many 22 in. by 16 in.; and while it is difficult to say there is an advantage in this size, we find them easier to work, and fancy the coke is better. We also imagine that we get more therms. We have been making experiments recently, and have set up in one of our houses a 24 in. by 18 in. and a 21 in. by 15 in. retort; but I cannot give you results, because we have had a little trouble with the hydraulic main. However, a very interesting fact has shown itself. Both these retorts are charged with a projector type of machine, and as there is no free space between them they are at the same temperatures. Yet the free carbon in the tar from one retort is double that from the other. With regard to it not being wise to work at temperatures from 1325° to 1350°, we work for long periods up to 1400°, and have not noticed any effect upon the setting. Therefore I should like to know what reasons the author has for setting a limit to the temperature. I notice his setting is designed with a special combustion chamber arch to prevent the lifting of the combustion chamber arch itself and the walls of the retorts. We have had rather a strange experience. Previously our trouble has been through the expansion of the silica lifting the centre portion of the walls, and raising the inner side of the retorts, sometimes to the extent of 4 in. or 5 in. Since the silica brick manufacturers have been put on their mettle, they have apparently got a better material or better processes, because in our new settings we have found exactly the opposite effect. We have had a slight settlement, probably due to the expansion joints or timber which we have put in. I would like to congratulate the author on his installation of Congdon standpipes. Our experience at Beckton is not in their favour; but I think I have said before that this is due to the length of the connection between the mouthpiece and the standpipe. The design shown by the author, I should think, would be an excellent one, and I am really very sorry it was not available some years ago when I recommended them. I should like to mention that the design which I showed in 1919 is hardly representative of the type they use in America. I was over there in 1920, and they certainly did not use that type of Congdon pipe then. It seems that I have used a very old one; and it is hardly fair to the American engineers to compare the new type with the old type. I do not think the author of the paper has said quite sufficient about the coke plant. Coke, as everybody knows, is troublesome to handle, and we should like a little more detail as to how the plant is designed. I have always been led to understand, and my experience has shown me, that telpher plants for an installation of the size of the author's are on the slow side. Perhaps he has arranged for two telpher drivers, or he may have some other means for speeding-up. Will the author give us the cycle of operations, and also some idea of the cost of handling the coke?

Mr. R. E. Gibson (Liverpool): There are just two points I would like to mention. I congratulate Mr. Carr on the splendid results he has obtained with the use of slacks. At the same time, if we all went on to slacks I am afraid there would be no advantage in their use, because the price would probably go up to that of screened coal. Moreover, the throughput is bound to be reduced where slacks are used. The results at Stretford are very remarkable, and reflect great credit on Mr. Carr and his plant. I notice he has made special provision for the use of coke breeze in his producer. This may be suitable to the local conditions; but at Liverpool we have no coke breeze at all. We have plenty of coke, but no coke breeze; and therefore such furnaces as those at Stretford would be useless to us. I am sorry that this paper was not distributed before the meeting, because it puts one at a disadvantage in discussing it. The paper is full of interesting points which are worth careful study, and will undoubtedly help us very much in the future.

Mr. Thomas Hardie (Gas Light and Coke Company): I should like to add my thanks to those of the other speakers to Mr. Carr for his very interesting paper. The main point that struck me in listening to him was the extraordinary thoroughness with which he has studied the subject, and the care with which he has come to his decisions. He has considered all classes of carbonizing plant; and it is very interesting to-day to find an engineer who is prepared to consider all types. Many engineers seem to have got it into their heads that a certain type, whether it is one or the other, is their particular type under all conditions; and therefore I was very pleased that Mr. Carr examined so many types of plant before he came to a decision on the matter. I particularly wish to congratulate him upon using the Congdon pipe, and I wish to express appreciation of the thoroughness with which he has worked out the details of that piece of apparatus. The results he has obtained, I think, set us a new standard in horizontal retorts using slacks, and are such as we shall all be very anxious to reach. He has not explained it; but I think that the installation of the Congdon pipe is the possible explanation of these very fine results. The cooling of the gas as it leaves the retort, instead of it being brought up ascension pipes, has no doubt led to these important results. It has been an extremely valuable paper; and I am only sorry that Mr. Carr had to miss out any part in reading it. It is a pity we did not have the paper earlier, so that we could have discussed it more fully, though I feel that, from the thoroughness with which one can gather he has gone into the various details of the plant before he put it in, it would be rather dangerous to criticize merely on hearing it described this afternoon.

Dr. Parker: I should like to ask if the author has experienced any difficulty in getting the pitch out of the connecting piece between the mouthpiece and the standpipe, in the case of the Congdon pipe. Then the author mentions 40,000 c.ft. of straight coal gas as being the equivalent of a ton of coke. Owing to the large amount of excess air required to burn straight coal gas and also to prevent the deposit of carbon on the regenerator tubes, I think the figure should be more than 40,000 c.ft. Finally, would the author tell us where the samples of gas were taken?

Mr. S. Shadbolt (South Bank): I should like to congratulate the author on the thoroughness with which he has gone into this matter. Of course, the usefulness of these papers is largely found in their application to districts having similar circumstances to those of the author, and in the present case I imagine we must take it that considerations of the conservation of our coal supplies did not trouble Mr. Carr. There is a good deal in the point made by Mr. Gibson, that many of us cannot burn these slacks even if we could get them cheapiy. Nevertheless, I think we shall all congratulate Mr. Carr on what he has done.

Mr. H. Davies (Chesterfield): As one representing a small gas-works, I must say that Mr. Carr's results are certainly extremely good. I have had the opportunity of installing similar plant to Mr. Carr's and operating it for the past six months; but I must confess that I have never been able to get the figures that he has mentioned in the paper. I should appreciate it if Mr. Carr would give me the privilege of going over the Stretford works and seeing how he does it. I am always willing to learn. With regard to the charge of 16 or 17 cwt. when using these retorts with slack, it seems to me that the charge is rather large, and must cause some difficulty in discharging. I should like to know whether the author has any difficulty in that respect, with consequent damage to the retort. With regard to the liquor, at 120° one must naturally expect some loss; and I should be glad to know whether this has been Mr. Carr's experience. He has only had four months' experience; but perhaps he will be able to give us some information on that point.

The President, in closing the discussion, said that, on account of the late hour, he would ask Mr. Carr to reply on the following morning.

Mr. Carr: I desire to thank you for the very kind way in which you have received my communication. Mr. Toogood, who opened the discussion, dealt generally with the matter of design; and one point which he emphasized—and with which I think we shall all be in agreement—was that, in order to ensure low fuel consumption, the producer in the first instance must be of large capacity, and that the regenerators cannot be too large. That, of course, was a factor which had an influence on the design of the settings, and, I believe, was a great factor in the results obtained up to now, so far as fuel consumption is concerned. Mr. Toogood also referred to one of the main objects being to bring as low as possible the net cost of coal. This was aimed at, of course, from the outset, and in the arrangements for gaseous heating the factor was that these arrangements should be available if residuals were a strong market. Of course, if coke is a weak market, obviously it pays to heat the settings with their own producers, utilizing the coke, rather than use gas from extraneous sources, whether it be producer gas or coal gas.

Mr. Collett asked if the retorts were 95 p.ct. silica throughout. That is so, and I think it is mentioned in the paper. With regard to liquor circulation, also mentioned by Mr. Collett and other speakers, the temperature of the liquor is admittedly high; and I might say in this connection that I think better results would be obtained if the liquor were cooled to a greater extent. In the other separating tanks which are now being put in, arrangements are being made to pass the feed water for the waste-heat boiler through a heater situated in the tank to serve a dual purpose—viz., to preheat the water for the waste-heat boilers and to cool the liquor. I think by this means it will be possible, instead of having a difference in temperature of the liquor leaving the standpipe—*i.e.*, till the point it is pumped from the separating tank—of 18° Fahr., we should get a difference of something like 35° or 40° Fahr., by cooling in the separating tanks. In that way we should get shock cooling to a greater extent than we do to-day, and a better scrubbing effect. No difficulty has been experienced in pumping the liquor at 170° or 180° Fahr. The pumps are of the ordinary Evans "Reliable" type; and though they have only been working for six months, they have shown, up to the present, no sign of deterioration. Mr. Collett also raised the very important point of the quenching of the coke on the floor. In my hurry yesterday I probably did not explain clearly what the arrangements really are. The way in which it is intended to deal with the

bulk of the coke is to pick it up with a high-speed telpher, and discharge it into a coke quenching bench situated outside the retort house, having done a preliminary quenching by hose as the coke is pushed-out from the retorts into the telpher skip. The telpher will not wait, but will simply discharge one skip and then return for the next skip. That is the intention; but this part of the scheme is at present only under construction, and at the moment we are quenching temporarily in a quenching tank, because in order to maintain the supply of gas the work had to be carried out in two stages. The first stage was the extension of nine beds, and the second stage the reconstruction of two beds of eight retorts in the existing house; and we cannot use the new coke arrangements until the reconstruction is finished, while the reconstruction could not be carried out until the nine beds are completed. The President has just referred me back, and asks what I mean by a high-speed telpher. The normal speed of a telpher depends, of course, entirely on the gearing of the motor; and when I speak of a high-speed telpher I speak of a machine which, given a clear run, hoists and travels at the same time, which was not so in the case of many of our old machines. As soon as the skip is lifted off the floor, and is quite clear, the travel commences. I am afraid I cannot say what the actual speed is, because I do not remember.

Mr. TOOGOOD: What is meant by a high-speed telpher is not only that the speed of the telpher is 500 ft. per minute or more, but that the construction of the quenching benches in connection with the telpher is quite novel inasmuch as the telpher will pick up the skip at the bench, take it straight away, put it on the quenching floor, and come back again. Therefore the whole time of disconnecting ropes is saved. Hence this is a high-speed telpher—about twice the speed of working of the usual telpher.

Mr. CARR: Thank you. The next point is with regard to dealing with the coke on the quenching bench. When the coke is discharged on to this, there is an automatic lifting bar; and on the return of the telpher for the second load of coke, the bar will be automatically lifted, and the coke will be discharged into the hoppers which supply the coke elevators. It has yet to be proved that the speed of operation will be adequate, having regard to the size of the house, with one telpher machine. The period within which we hope to complete the cycle into the house, discharging and back again, is 1 min. 20 sec. That is what we are aiming at; but I wish to make it clear that that is an estimate of what we hope to do, and is not a figure which we have achieved. A further question by Mr. Collett was as to the quality of the gas we are supplying. We supply 500 B.Th.U. gas at the moment, and it is our intention to declare that. We are diluting with water gas for this purpose; but it is possible that, when the whole of this extension is completed, we may declare a higher calorific value. That, again, depends largely upon the commercial circumstances at the particular period.

I am very pleased to hear from Mr. Leech's very kind remarks that he agrees with me that horizontal retorts were the right thing for Stretford. The section of the retort, 24 in. by 18 in., was chosen as being, in my opinion, the most suitable. We had retorts at Stretford 21 in. by 15 in. The old retorts were that size, and they were 20 ft. long; and so far as our short experience has gone, there is absolutely no comparison which could be made in results, because there are so many factors in the new plant which did not exist in the old. But I think with a simultaneous machine such as we have, as distinct from the projector type of machine, the 24 in. by 18 in. section is the most suitable; and dealing with Lancashire and Yorkshire coals, I venture to think it is the most suitable size, even for the projector type of machine. Mr. Leech said he could not give us the comparative figures for retorts of 21 in. by 15 in. section and retorts of 24 in. by 18 in. section. That is, of course, a difficult matter. If we had the two sections, both with standpipes, the figures would be very illuminating. One advantage of the standpipe is that it is a very simple matter to take samples of gas representing a period of carbonization when you have five retorts connected to the same standpipe. Another point raised by Mr. Leech was with regard to the free carbon in the tar. As long as the charges are maintained and the carbonizing period is not too drawn-out, we can keep it low. The free carbon in the tar is, of course, less when working on the eight-hour carbonizing period than it is with the twelve-hour period, when we have a higher temperature following the tailing-off in the last four hours of carbonization. Mr. Leech also raised the question of the coke plant, which I have already dealt with, except that I want to make it quite clear that the quenching tank is provided for use only in an emergency when the quenching bench or the mechanism in connection with it is out of operation. I want that to be clearly understood, because I think it is generally agreed among all gas engineers that immersion of coke is not at all desirable in any circumstances. I cannot reply to Mr. Leech's question as to the cost of handling coke, because the scheme is not yet completed.

Mr. Gibson mentioned the fact that we could not all use slacks, as the price would then probably go up to the price of screened coal. I appreciate that the price of slack would undoubtedly go up very considerably if it were extensively used by gas undertakings. At the same time, I do not quite agree with Mr. Gibson that it would go to the price of screened coal, because, after all, the kind of slack which is bought by myself, for instance, is from coal that is not being sold to gas-works, but is slack which is on the market from household fuels and other fuels. Mr. Gibson referred to the fact that the throughput was reduced if slacks are used. That, of course, is true in a measure. I would estimate the reduction in the throughput, using half-inch slacks as against large coal and nuts, as being approximately from 8 to 10 p.ct. Mr. Gibson also said that they were fortunate in Liverpool in having no coke breeze. This, again, I appreciate. When the coke leaves the retort house there is no breeze; but I would, with all respect, say to Mr. Gibson that, if he has a few thousand tons of coke in stock, there must be some coke breeze when that stock is moved. Even if he is making coke as hard as furnace coke, he will make some breeze when he moves the stock. There are times when we all of us must have some coke breeze; and the intention of the separate producer is not only to use coke breeze, but to use the cheap slacks containing up to 30 p.ct. of ash. There is a large quantity of slacks—almost colliery waste, you might call it—lying at the collieries to-day, which can be purchased very cheaply by those undertakings situated in the vicinity of the collieries; and this particular producer, with the super-imposed retort, is specially designed for the purpose of utilizing such slacks as producer fuel. These slacks can be bought, for instance, delivered at the Stretford works, at 7s. or 8s. per ton, and that is undoubtedly an economic factor. Even if coke is only worth 14s. a ton, and you can use cheap slack in your producer at 7s. or 8s. per ton, there is a great economy to be effected in heating. I refer, of course, entirely to the Stretford circumstances, and works similarly situated. To show it is being successfully done, I would refer you to the work with this super-imposed retort at the works of the Portland Cement Manufacturers at Swanscombe, and also to the experiments which I myself carried out at Preston. I have here a sample of the coke made in the passage through the retort of a Scotch washed fine at the works of the Associated Portland Cement Manufacturers. Here is a sample of the fine slack that was passed through, and here is a sample of the producer fuel that was made from it. This slack has a fairly high ash content—over 20 p.ct.—and the producer fuel was, as you will see, coked to a very good degree. The period of the passage of the slack through the super-imposed retort is not more than 40 or 50 minutes; and the temperature at which this coke is produced is approximately 500° to 550° Fahr. That is the average temperature in the retort. I explain it by two things—first, direct heat transference; and, secondly, the mechanical action of turning over the particles of coal in contact with the heat. It does, I submit, become a factor which is worthy of the consideration of those undertakings situated in close proximity to the coal supplies, where this very cheap coal can be obtained, of gasifying such cheap fuels for the purpose of heating the retorts, provided it can be successfully gasified. I should like to make it clear that on this matter I am now speaking of what has been done elsewhere, and of what I hope to do at the Stretford works.

Dr. Parker had asked if there was any difficulty in getting the pitch out of the connecting-piece between the mouthpiece and the standpipe. It is only 7 in. from the inside of the mouthpiece to the face of the valve; and the retort house lid-man has a small auger at an angle which he inserts into the opening of the valve, and moves up and down. There is no difficulty in getting them absolutely clear. The standpipes are arranged with the seal pots on the stage floor level, and are cleared out at each shift by the lid-man, who goes round and simply fishes to see if anything has been pushed through. We get about half a bucketful of mainly a mixture of carbon; but we have had no signs of pitch. It is a mixture of carbon and thick tar; but up to the present we have had no signs of pitch in the working of the standpipes. Another point which Dr. Parker raised was with regard to the figure I put forward of 40,000 c.ft. of straight coal gas as being approximately equal to a ton of coke; and he suggested that, with the excess air that would be required for the combustion of straight coal gas, and also to prevent the deposit of carbon on the regenerator tubes, a greater volume would be required. My estimate was made as the result of some investigations I was permitted to carry out owing to the facilities given me by the Chemical Company at Normanton, where they have been firing with coal gas for a considerable period, both preheated by regeneration and by admission direct into the producer arch below the combustion chamber. It was on the basis of the results of these investigations that I put forward this figure of 40,000 c.ft. I appreciate the difficulty which Dr. Parker mentions; and as a means of overcoming the question of carbon deposit, I think it will be probably necessary, on coal gas firing, to dilute with a certain proportion of either waste gas or, alternatively, with producer gas from external sources, because trouble has been experienced with straight coal gas firing through carbon deposit, as Dr. Parker rightly estimated. With regard to the samples of waste gas, these were taken at the end of the main flue, almost on the point of admission to the waste-heat boiler. The percentage of oxygen is low. We have had traces of CO in the gas, but only slight traces; and I put it down to the tightness and general efficiency of the new settings.

Mr. Shadbolt, in his remarks, suggested that the conservation of coal supplies was not a consideration of mine. I must rather

take exception to that. Possibly Mr. Shadbolt was looking at it from the point of view of gaseous therms; but there are, I suggest, two points of view. There is the point of view of maximum gaseous therms from a certain volume of coal, and the point of view of the maximum yield of both solid and gaseous therms. Both Mr. Shadbolt and myself—and, indeed, all of us—are aiming at getting the maximum yield; but Mr. Shadbolt takes the view that we will probably economize coal to a greater extent by getting the maximum yield in gaseous therms, and possibly I, being somewhat differently situated, do not quite see eye to eye with him. I will not delay the meeting now by giving the figures of the heat balance from which I showed an efficiency of carbonization of 82·04 p.ct.; but I will communicate them as part of the discussion. The only other point to be dealt with was that raised by Mr. Davies, of Chesterfield. I shall be very pleased to see him at Stretford, and show him what we are doing. With charges of 17 cwt. of dry coal evenly laid, we do not find the expansion on completion of coking has left a great amount of space at the top of the retort. We have had no trouble whatever in discharging; and I think that in these circumstances 17 cwt. charges are not excessive in 24 in. by 18 in. retorts.

The PRESIDENT: I am sure I voice the opinion of the meeting when I tender, on your behalf, our thanks to Mr. Carr for his very practical engineering paper. I feel specially indebted to him, because, when I approached him several months ago and asked him to write a paper on his new works at Stretford, he said he was very busy through having to meet a great increase in the demand for gas; but if it were my wish, as President, he would do it. He has fulfilled that promise to the utmost, and I personally thank him very much. On your behalf, too, I offer him our hearty thanks.

Mr. CARR: I thank you very much for the kind and patient way in which you have received the paper, and the reply to the discussion. I should like to say that I am indebted to the President in several ways. When the scheme first came under consideration of my Board at Stretford, another opinion was taken at my suggestion; and that "other opinion" was our President's. He supported the proposition I had put forward. I should also like to express my thanks to Mr. Toogood, who has co-operated with me in achieving what we have done—and I think we have realized some measure of success in this new setting. I should like to thank Mr. Ashley, of Messrs. Aldridge & Ranken, who assisted in carrying out various suggestions and modifications that we have made in the Congdon standpipe; while, finally, I should like to be permitted to express my thanks to my own staff, without whose help I could not have given this paper.

REPORTS RETAINED FOR PUBLICATION LATER.

This number of the "JOURNAL" is a complete record of the proceedings at the Annual Meeting of the Institution, in that an abstract of *all* the Papers and Discussions and the Verbatim Report of the sessions appear in it. We regret, however, that the unusual length of the contributions and discussions, coupled with postal restrictions, necessitates the holding-over of the following Reports: Wrought-Iron Tubing; Joint Refractories; Illumination Commission; and Gas Research Fellowship. It is our intention to include these as Supplements to our July numbers.

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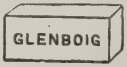
TRADE 

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DEVELOPMENTS IN GAS CALORIMETRY.

By Prof. C. V. BOYS, F.R.S.

Mr. C. F. Botley (Vice-President) took the chair in the absence of the President—who was detained at the luncheon—and called upon Prof. Boys to give his paper. (The President arrived later.)

Introductory.

Members of this Institution may remember that on a former occasion I gave an account of the progress which I had made in constructing a recording calorimeter; in fact, I showed this in action at the meeting. Subsequently I lectured on the same subject at the Royal Institution, and showed in action the instrument which I had constructed myself, and also one constructed by Messrs. John J. Griffin & Sons, Ltd. I showed also a "spot-test" calorimeter and meter, based on those of the recording instrument, and I indicated that this spot-test instrument promised advantages, especially in testing the gas of the smaller undertakings.

It was immediately after this that I first came in contact with that very remarkable material "onazote," or nitrogen-filled rubber, which is the most perfect non-conductor of heat known at the present time. The possibility of using this not only as non-conductor but also as water-containing material made into any form by the direct process of moulding, and so avoiding altogether the use of metal for this purpose, indicated such manifest advantages that, whether wisely or not, I determined that such advantages must be attained. I did not realize how long it would take to get a start on experimental construction. However, when the first "Block" calorimeters were made after inevitable difficulties had been overcome, their behaviour was so admirable that I felt the delay had been justified by the event. The Gas Referees had these under observation in their laboratory, and were satisfied; and then trials conducted in official testing places confirmed the accuracy and convenience of the new instrument. They found after a further lapse of time, however, that these instruments were beginning to give results which at first were almost imperceptibly in error, and which after a time showed increasing irregularity. After repeated attempts to cure this trouble had proved unavailing, I was driven after a loss of two years to abandon the use of onazote as a water-containing and insulating material, both for the recording and the spot-test instruments. If the inventor should succeed in overcoming the difficulty due to contact with water, its use might be considered again, but after this experience it would require the test of a year's service at least.

With disappointment and regret, therefore, I have had to go back to the form of calorimeter which I showed at the Royal Institution, and which it is convenient to distinguish as the "Box" calorimeter, and it is upon this and the consequent equipment suitable for small country places that I wish to speak more particularly to-day.

The Box Calorimeter.

In carrying out their duties, the Gas Referees have been much oppressed by the cost and elaborate procedure which have grown up round the ordinary water-flow calorimeters, and which make their provision a burden which is serious in the case of small country places. This applies less to the equipment within the testing place than to the time required of the Gas Examiner and the tedious nature of the operation which he has to conduct.

It is with a view to reducing this burden that I have designed the complete equipment illustrated in fig. 1. In this it will be seen that the water required for the test is contained in a small tank standing on a stool on a table, and that the water, after passing through the calorimeter, is received in a similar tank below the table. For this reason it is unnecessary that water should be laid on or that a sink or drain should be provided, and the table may be made to stand in any convenient place to which the appropriate gas supply can be taken. The use of the same water over and over again, whether this water is distilled water, clean rain water, "tap" water, or boiled tap water, has certain advantages. While the gas in different places may differ, no trouble to the calorimeter arises on that account. On the other hand, the local water may differ, and the possible action of extra hard water on the one hand or peaty water on the other has been an anxiety rather than a material inconvenience. However, only recently the Gas Referees have met with a case where trouble has been caused by the fact that the water from the street mains appears to be a kind of soda water, and evolves so much gas as to interfere with continuous running of the present instrument, and to necessitate special measures. The re-use of the water not only removes the difficulties due to its doubtful quality, it also has the effect of causing the water to be very closely the same in temperature as the room in which it remains and the air used for combustion. A gas burner is provided below the upper tank, so that the water if too cold may be warmed.

Two other features of the water circulation are worthy of note. A hand pump is provided on the right-hand side of the table so that the water may be pumped back to the upper tank. The delivery pipe leads this water to the bottom of the tank, so that, by continuing the pumping operation, air is pumped into the water, and the stream of bubbles causes circulation of the water and uniformity of temperature. I have done away with the overflow funnel system for determining the water rate, and replaced it by a carburetter device derived from motor-car practice. When the main tap of the upper tank is turned on, the water runs into a down tube, with the usual perforated disc at the lower end. When, however, the water has reached a certain level, a float carrying a needle valve arrests the flow of entering water until it is just equal to that leaving the orifice below, so that the water is maintained at a constant head, and a constant flow is assured. The down tube can be moved to a back-stop, and then the water merely runs into the lower tank, or to a fore-stop, in which case it passes through the calorimeter. The water which has passed through the calorimeter leaves by a swivel outlet tube moving between stops. At one position of the tube it runs away to the lower tank, while at the other it is directed into a measuring flask like an ordinary litre flask, but with a divided neck, so that the amount run out while the meter drum makes (*e.g.*) four or five complete turns may be determined with great accuracy.

The water circulation within the instrument is very similar to that already described in my recording instrument, except that there are no operative thermometers, and the inlet and outlet thermometer ways are only $\frac{3}{4}$ in. in diameter. As in my recording instrument, the hot water leaving the hot thermometer tube passes through a helix of copper pipe round a cylindrical copper shield surrounding the calorimeter structure down to that level at which the water rising in the lead interchanger begins to change in temperature rapidly. By this means the insulation round the hot part of the instrument is relieved of the duty of preventing loss of heat to the casing which may be 10° or 20° C. cooler than itself, for it is surrounded by a shield of sensibly the same temperature. The insulating material which I have finally selected is compressed cork, such as is used for cold-storage insulation, round the interchanger, and granulated cork filling the wooden casing, well packed in and protected from access of moisture by means of an ebonite cover hermetically connected to the upper ends of the water passages in which the thermometers are placed.

Turning now to the gas circuit, the gas to be tested is brought from the service pipe to an efficient governor such as two governors in series, thence to a T, where one portion of gas passes away to a clearing burner, so that live gas may be tested, and not that only which is dormant in the service pipe. The other branch of the T leads through a micrometer tap to the Boys Bell Meter, and so to the burner. This consists of a narrow inner tube terminating within a plain parallel silica tube open above and below, which latter is held in a spring clip, and so can be moved down to be lighted and then be pushed up to its

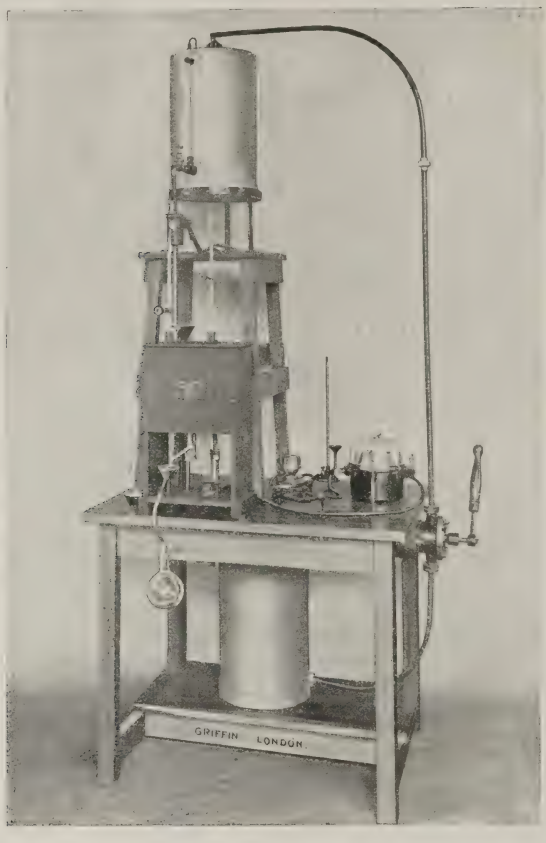

FIG. 1.

upper limit. This burner has the advantage that no moving gas connections are needed, and that the gas is somewhat aerated before combustion. It is, therefore, possible to burn as much as 1 c.ft. per hour without the formation of smoke or risk of imperfect combustion. The hot gases rise up to a silica dome and descend within the lead interchanger as in the recording instrument already described, and then entering an annular lead bowl are led down through the table, together with condensed water, by means of a lead duct. It is merely necessary for the Gas Examiner to find the position of the micrometer tap that will allow of the intended number of complete turns of the meter drum while the water is filling the flask up to some point in the neck, and this setting may be repeated with such small variation as may be convenient from day to day. As the exit water acquires its final temperature in a quarter of an hour, and the Gas Examiner has to make no adjustments of gas (after the first) or of water, and as, moreover, the tiresome process of proving the meter is unnecessary, it will be seen that the work of the Gas Examiner is curtailed and simplified.

I have so far described the Box calorimeter and its equipment merely as a calorimeter. The equipment, however, makes it possible for the table to be in itself a complete testing place. Then instead of a stool to carry the upper tank, a cupboard would be used in which the Gas Examiner could lock up all his books and papers. On the side of the cupboard there is room to fix the pressure gauge and the sulphuretted hydrogen apparatus, and a hinged flap in front would provide a convenient writing slope.

The Boys Bell Meter.

I have referred to the Boys Bell Meter, but a few words on this may be desirable. The ordinary test meter delivering one-twelfth of a cubic foot per revolution when in good order is a perfectly good instrument, but the Gas Referees have had much trouble in testing places, chiefly from "sticky" meters, that is those where from imperfect lubrication or other cause the friction in the stuffing box is both great and variable. They have also been troubled by small leakages developing in a surprising number of points of the meter, and also in badly made stoppered T's of the meter-proving measure. I have, therefore, wished to find some way of getting rid permanently of all these faults. When designing the recording calorimeter, the meter problem was forced upon me, and I believe the whole of these troubles have disappeared for ever in the meter I then designed. The chief peculiarity of the recorder meter was the use of a drum loose upon a screwed axle. The axle was turned at the required rate by clockwork, and the drum, relieved of all axle friction, was turned by the incoming gas. If the gas entered too fast, the drum turned faster than the axle, screwed itself along, and by so doing reduced the gas supply. The drum had no work to do except that of turning in the water, and thus the irregularity of gas flow consequent upon variations in gas pressure or friction were wholly eliminated. I am unable to use this feature in the Bell Meter as adopted for independent use, but I do retain the advantages of the original meter; for there is no stuffing box, but the axle moves in bearings in the water of the meter. (Fig. 2.) I still retain the buoyancy chamber which supports much of the weight of the drum, and besides forms a solid floor to the major part of each compartment at the critical moment at which a charge of gas is trapped within it. Leakage is impossible, as the drum is covered with a glass bell, making a joint with the bowl below the water level, and this allows the drum itself to be seen and its smooth working observed. Finally the water level is determined by the use of a submerged needle, which just disturbs or does not quite reach the surface of the water during the work-

Fig. 2.

ing of the meter. This level can be ascertained by reflection from the surface with far greater accuracy than any water line on a window can be read, and the actual level is made of less importance by the existence of the buoyancy chamber. In fact, this is its primary object. For these reasons this meter has great advantages both in accuracy, convenience, and, I believe, permanence over the usual form of meter. Provision is made for adding or subtracting water when setting the water level by the point, and the elimination of the operation of meter proving is itself an advantage. I used celluloid as the material with which to construct the drum, and its transparency is certainly an attraction. Messrs. Griffin are making the drums either of celluloid or of pure nickel. The capacity of the drum for the recorder and spot-test instrument is $\frac{1}{10}$th c.ft.

It would be almost too much to expect that where so much is gained from a radical change in design there should be no new fault or inconvenience. I know of only one inconvenience. Where the bell meter is left in a room which falls in temperature, especially if it is just below a window, the glass cools more than the water, and condensation occurs which in time completely obscures the view and makes observation impossible. This is best kept down as far as possible by covering the whole meter when not in use with a large protecting case. Any dew which may nevertheless be formed can be removed either by the application of a warm rubber water bottle made to fit over the bell, or simply by radiation from a luminous flame. If by either of these means the glass is warmed even a very few degrees, the water upon it will rapidly evaporate and condense on the water again. I have not yet been able to prevent the formation of dew by any coating within the glass, and I have not as yet cared to try the use of salts solutions with a smaller vapour tension, but that is a possible cure.

In a few cases where inconvenience had arisen from the necessity for frequently proving the usual meters and from other causes, a Bell Meter of $\frac{1}{15}$th c.ft. capacity has been substituted, and those in charge have approved the change.

Average Calorific Value of Gas.

Still confining my observations on this occasion to the needs and difficulties met with in the case of small undertakings, there is one for which up to the present the Gas Referees have not found a solution which can be considered altogether satisfactory. The difficulty is to find a value for the average calorific value of the gas supplied, when financial considerations unduly limit the number of tests. If the number of tests is too small, obviously there is a risk that the gas from a small works, of necessity more variable in quality than that to which most of us are accustomed, may be on the very few occasions of test caught at an unhappy moment when it is in a state of depression. Tests made at such times and unbalanced by tests made at more favourable times may give an unfair value for the average that has been actually delivered, and it is very little consolation to the Gas Manager to know that in the course of years the value must average out all right, if his undertaking is discredited on the unhappy occasions, and gets no credit for those in which he excels. It is not possible to remedy this hardship by increasing the number of tests indefinitely or even at all, because the cost of the tests becomes an item in the local rates, and the local authorities might refuse to make any test at all. As it is, it is only too often found that the limited number is considered excessive by the local authority. The result is that the number finally determined is a compromise, and like all compromises is not altogether satisfactory to any of the parties. The consequence is that the small gasworks have to provide gas which on the whole is of better value than that which they have declared if they wish to be safe from an adverse report.

It is to reduce this hardship that I have brought forward the simplified testing appliances and method described above. But that is not all. I now wish to indicate a further possibility—it is not more than that—that of obtaining a fair average value by a method of sampling, but here I am treading on delicate ground. Gas engineers know from experience that gas kept in their holders does not always retain its full value, and any system of testing gas that has been kept any length of time will be looked at with the gravest suspicion. All I now do is to ask you to remember that gas stored in holders and exposed to the cold at night may well have condensed out of it volatile and valuable constituents, and that such gas especially in cold weather may fall off in value. What I am now suggesting as a possibility is that in small country places the gas should be slowly and continuously drawn into a small holder in the testing place which is not exposed to the cold of the night sky, and that the Gas Examiner should make a test on the gas which, if there be no loss of quality, is an average of all that has been delivered since his last test. I am not saying that there is no loss of quality. I do not know, and in these matters it is unsound to assert that there can be no loss of quality because we do not know why there should be. That is a matter which can only be ascertained by direct experiment, and with all the different kinds of gas provided in the country it does not follow that the answer will be the same for all. Fortunately the gas engineers and gas chemists throughout the country are able to examine this question, and, in fact, without their help it would be impossible for the Gas Referees to examine every make of gas. With this explanation of the position, and remembering that what I am now putting forward is no more than a possibility which the Gas Referees could adopt only if found satisfactory and not otherwise, I think it desirable to explain the suggestion in more detail, and its many advantages to every interest concerned.

The sample of gas would be collected in a special gasholder in the testing place, maintained if necessary at a uniform temperature. The gas from the service pipe would pass through a governor to a T where one branch would lead to a clearing burner, while the other would lead to the holder. The governor would reduce the pressure to a fraction above atmospheric. The gas would enter the balanced bell and lift it as fast as a clock over the bell would allow. The chain from the bell to a balance weight made as a sprocket chain would pass over a sprocket wheel connected by a clutch to a clock-turned axle, the clutch acting in such a direction that the bell could not rise faster than the clock allowed, whereas it is always free to descend when weighted. The clock would be so geared that the bell would fill in any preordained time. In the example on which I have extemporized such a contrivance the bell fills in a week, but the time may be varied indefinitely. When a test is to be made, the incoming gas is cut off; the gas in the bell is led to the burner of the calorimeter, and the continued going of the clock has no influence on the outflow. The bell may then be weighted as desired. As a complete test may be made with the Box calorimeter in 25 minutes, and the gas is burned at 1 c.ft. or less per hour, a holder of very moderate dimensions only is needed. In the bell now before you, which was made by Messrs. Griffin & Sons, the annular space between the bell and the dumpling is as narrow as is consistent with free working, and the dumpling is above the water level. In consequence the gas is in contact with a very narrow ring of water only, the object being to make diffusion of soluble constituents of the gas as small as possible, so that when once the water has become saturated there should be no appreciable loss from this cause. The bell should not be filled so much as to leave less than say 2 in. of its edge immersed.

In taking the sample the question arises, what is the fair thing to do at night, say, for six hours, when the amount of gas passing in the mains is so very small. It does not seem fair to the gas undertaking to sample this equally with that passing in the busy hours of the day. One advantage of the clock sampling is that it lends itself to any system which in the future might be determined. For instance, a rough-and-ready plan would be to let the clock cause a detent to engage with the chain, say from midnight to 6 a.m., and stop taking in any gas at all for that period. Or, if it is considered better to take some account of night gas, the detent would be replaced by a slower moving tooth engaging with the sprocket chain or chain wheel, and the bell would take in gas at any reduced rate that might be desired. It is not necessary to show how any variation of rate could be produced. The mechanism is so simple that any proposition can be met.

There is one detail about the bell holder that should be mentioned, and that is the use of a sprocket chain of such weight that 1 in. of it weighs as much as $\frac{1}{16}$-in. length of the sides of the bell. Or, if that is too heavy to be convenient for the chain, then an additional idle chain passing over a pulley should make up this weight. By this means the change in the pressure of the gas caused by changing immersion and buoyancy is eliminated, and a governor between the bell and the burner becomes unnecessary.

Having now indicated, I hope sufficiently clearly, my proposal for obtaining a fair sample of the gas, I would ask you who have the control of small country works to consider it for the present as a kind of fairy tale which, if time and experiment should prove it to be true, should appeal to you as the work of a kind fairy. While you are doing your best with the manifest disadvantages which surround the manufacture of gas on a small scale, and while you are supplying gas which taken all round is all that you are required to supply, you are relieved from the unfortunate effect on your average of a test made at an unhappy moment, but are given credit for what you have done. And if any should be here who represent the consumer, and after all we are all consumers, then you equally are assured that a satisfactory test means that you have got what you have paid for, at least as far as the average goes. If it should all work out well, the more important object of the Gas Regulation Act would be attained, and this for the smallest place and at the minimum of cost. The consumer pays for value received and not merely for cubic feet of nebulous material. This test does not meet that other requirement of the Act—the 6 p.ct. two hours' minimum. This can be looked for as at present by a gas examiner whenever he tests, for he can examine the current gas as well as the stored gas.

Discussion.

The President: I think we are to be congratulated as an Institution in having as Gas Referees men like Prof. Boys, gentlemen of high scientific attainments who are not satisfied merely to administer the Gas Regulation Act, but who do all they can to help us to see that the gas we supply receives its full value. In Prof. Boys we have not only a scientist, but a gentleman of high mechanical attainments; and I desire to offer him on your behalf, not for his paper, because I do not regard it as a paper, but as a wonderful lecture, our very best thanks. When I asked Prof. Boys whether he would be good enough to give us a paper on gas calorimetry, he immediately said he would be pleased. Unfortunately, Prof. Boys, like myself, is not a young man, and he has not been very well; but we rejoice to see that he is able to come here this afternoon and give us this wonderful lecture. What we as an Institution and as the gas industry desire is that our gas shall be registered accurately, and Prof. Boys, by his invention, has been able to devise an instrument that can be placed in the hands of those in charge of the smaller works, so that they can see that the gas which they supply is of full value. This, of course, is most important for the smaller undertakings. The larger works can afford to have skilled chemists; but that is impossible in the case of the smaller works. And I am sure it will be to the benefit of the gas industry if we can place at the different works a recording calorimeter which will give us the exact value of the gas that is being supplied; and we want no more. My connection with the Gas Referees has been a most happy one. I find that they are not antagonistic to us; and while they carry out, as they are in duty bound, the regulations of the Gas Regulation Act, they are very anxious to assist us. By your large attendance this afternoon you indicate the interest you take; and I think it is a compliment to our friend the Professor that, notwithstanding the beautiful weather, you have turned up in such large numbers this afternoon. I, as your President, tender to Prof. Boys our grateful thanks not only for his lecture this afternoon, but for what he has done to help us in the measurement of the calorific value of our gas. [Loud applause.] Gas is now sold on the heat basis instead of on a volume basis; and, as one who has supported this from the first, I am very glad to know that most of the gas companies in the country are now selling their gas on this basis, because we know the value of gas lies in its heat value, and therefore it is most important, in view of the enactments with reference to the quality of gas, that we should receive full credit for the quality that we send out. I am therefore delighted to know that we are now likely to have a recording calorimeter that we can, with the utmost confidence, place in large works and small works, and know that the register we get is the accurate value as sent out during the whole 24 hours. If anyone would like to ask Prof. Boys any questions, I am certain he will be very pleased to answer them.

Mr. R. S. Whipple (Cambridge Instrument Company): May I congratulate Prof. Boys on the beautiful invention he has brought before us? I feel that it is characterized, as all Prof. Boys' inventions are, by its absolute simplicity. He has dwelt a little bit on the difficulties of making a calorimeter; and if I may be allowed to say so, I, in a very much humbler sphere, know something also of the difficulties of evolving a satisfactory calorimeter. My colleagues and I at the Cambridge Scientific Instrument Company have been working for some time on a calorimeter, as Prof. Boys knows; and the time that passes away in some intangible manner in the experimental work does impress one very much indeed. You have to go on for a very long time before you can say that a particular calorimeter or a particular modification is a success. This, of course, is not only the experience of men making calorimeters, but it applies in many other directions also. I understand that in the case of Rolls-Royce cars, Mr. Royce has given definite instructions that no improvement or modification of any kind can be adopted on a car unless that improvement or modification has been tried for 10,000 miles on a car, and it is actually a fact that there are two or three Rolls-Royce cars running all the time in France trying-out improvements, because there are speed limits and police difficulties here which do not exist in France. This shows that even in engineering problems of that kind a great deal of time slips away. Prof. Boys has passed briefly over some of his difficulties; but I do not know whether it impressed you, as it did me, the way he has got over the radiation difficulty in the box calorimeter. I suppose he has used the analogy of the cascade electric furnace, where you heat outside in order that you may prevent radiation from the heat inside. I should like to ask whether he has thought at all of using kieselguhr as a heat-insulating material—that rather wonderful material which consists of some form of shell-fish or microscopic sea-shells, and which has the advantage that you have a large number of air spaces between the little pieces of shell, and I also think it is pretty independent of moisture. You can wet it without introducing very serious errors. Then, with regard to the gasometer, I think it is rather surprising that that has not been thought of before. For sampling the calorific value of coal, you take a little out of your various trucks, and lump them all together, and take a mean calorific value of the different samples; and it is really extraordinary that no one has thought of this extremely simple, yet very beautiful, invention of Prof. Boys, of having a gasometer which you simply fill up at a definite rate. I have no doubt that before long Prof. Boys will immerse the whole gasometer in a thermostatically-controlled water bath; and if he does so, I imagine that the difficulties of condensation and the other troubles he mentioned will practically disappear. I wonder if I might be allowed to tell you something which Prof. Boys has not mentioned, and that is that during the past twelve months he has received medals from two Societies for the invention of some of his instruments—viz., the Rumford Medal of the Royal Society, and the Duddell Medal from the Physical Society.

Prof. Cobb: I do not know that I have anything to say concerning this address by Prof. Boys in any spirit excepting one of unqualified admiration and eulogy. It is always a great pleasure to hear a gifted experimentalist tell the story of his own experiment, an inventor to tell the story of how his invention has gradually evolved; and this, I think, is probably the main source of interest in what Prof. Boys has had to say this afternoon. When the Gas Regulation Act—or, rather, the original recommendations on which the Gas Regulation Act was based—was made by Sir George Beilby, I think that a number of us thought that this question of how the quality of gas for primary purposes was to receive continuous record had been treated rather lightly; but that it is an extremely complicated question you will have been able to gather from the examples which have been put before you so lucidly by Prof. Boys this afternoon, without indicating the high degree of complication which is really present in some of the questions which have received a comparatively simple solution under his expert treatment. As I say, they are really very complicated questions demanding the attention of a skilled and thoughtful

experimental physicist, and Prof. Boys is to be congratulated on his labours in that connection, and the gas industry is to be at least equally congratulated.

Dr. H. G. COLMAN: I have been exceedingly interested in this matter, and will just refer to one point on which Prof. Boys asked for information—not that I am able to give him any information beyond what he has said. Regarding the variation of the gas when stored in a holder of this sort, he said he thought no chemist would give a definite answer, though he himself did not see any reason why there should be be any loss until he had made further experiments. Some years ago I did make some experiments, but I am not yet able to say anything much more definite than Prof. Boys has said. When gas was stored in an arrangement such as Prof. Boys has here, in which the temperature is maintained reasonably constant, I was never able to find that there was any definite loss, to a greater extent, at any rate, than 1 p.ct. At the same time, the number of tests I made were quite insufficient to make it a definite proof; and further investigation under varying conditions of gas is required, and would be of very great value to the industry, and certainly to the small undertakings, though perhaps, also, to others; but it can only be done by a large number of people undertaking the work.

Mr. J. W. WOOD: It has been my good fortune, on behalf of the Institution of Gas Engineers, carefully to examine three calorimeters which have been proposed for use; and so far as one can see, all the instruments proposed had certain defects, but there seemed a reasonable chance of any one of them working, at any rate to a practical extent. I was rather unfortunate in not being present this afternoon during the whole of the meeting, and listening to Prof. Boys' remarks. As Prof. Cobb has said, it is extremely interesting to listen to the remarks of a man who has carried out the experiments himself, and knows what the difficulties are, not merely of devising a principle, but in carrying his apparatus to such an extent that he can obtain quantitative results within comparatively close limits. The apparatus we have seen to-day compels admiration in every respect. Naturally, in my position in examining calorimeters, I am rather interested in technical details, but there is only one small point on which I should like to ask Prof. Boys a question, and that is what provision has he with his gasholder for blowing-up the holder. Is there provision to keep the rate down if the pressure on the supply system goes up unduly; and what provision is made if for any reason the gas supply should fail? Dr. Colman made some remarks about the variation. As long as we are concerned with permanent gases or comparatively volatile vapours, I see no reason why we should expect any variation of gas in a holder of this kind, provided the bell is constructed of suitable material. On the other hand, there is just the possibility that, in certain circumstances, on the cooling of the bell, compounds will be thrown out which, either by polymerization or for any other reason, remain permanently there, and then dissolve the other constituents of the gas, leading to a permanent deterioration of the gas in the bell.

Dr. E. W. SMITH: I should be glad to know, if the calorimeter is to be available for small works—I expect it will be—and will enable the engineer to carry out tests accurately in a very short time, why it should not also be valuable to large works. Prof. Boys assumes that a large works has chemists; but these chemists are highly paid—or should be—and their time is valuable, and some of them could either be dispensed with to some extent, or they could be put on to more valuable work. Therefore, I should like Prof. Boys to tell us why he does not suggest that this instrument would be useful on large works as well as small. I have been wondering whether the engineers of small works who are not going to carry-out regular tests to check up the long sample will be prepared to wait until the end of the month or week to see what their test would be, or whether they should carry-out fraction tests, and correct them for what they now call a bad average, and put the matter right. As regards the use of the holder, Mr. Whipple perhaps does not know that in Birmingham and many other works it has been the custom for many years to sample the make of gas continuously like that in 100 or 200 c.ft. holders, but not by clockwork means. If Prof. Boys can tell us whether it is proposed to sample the gas that is sold, or the gas that is made, I should be glad. If the sample is to be taken on the make, that would be all right; but if the sample is to be taken on the gas as it leaves the works, then no amount of correction of speeds will account for the variations in output, apart from variations in quality and in the demand from the consumers. I am delighted with the address, and should like to congratulate Prof. Boys.

Dr. PARKER: There are a few points in this calorimeter on which I should like to make one or two observations. In connection with the sample holder, I understand that the lute which is sandwiched between the dumpling and the outer case is very narrow, and that this should cut down the solubility of the gases; but I should imagine that, if you take an average sample over a long period, you might alter the composition of the gas owing to solubility in the inner part of the channel, and the diffusion of gases, owing to a difference of partial pressure, into the surrounding atmosphere. I foresee some difficulty there. Whether it would go up or down in value, is rather difficult to say. Would it be too expensive in so narrow a channel to substitute mercury? It means having an iron gasholder instead of a tin one. Then, as regards the question of sampling in proportion to the rate of gas, Dr. Smith has raised the point whether it would be used for sampling the gas as made or as sent out to the district. In any case, perhaps, it would seem rather difficult to sample in strict accordance with a make which was fluctuating very considerably, unless the holder was geared to some main meter. In connection with some experimental work, we have the idea of sampling gas made at very different rates at different times, by gearing a small meter to the large main make meter. It may in some circumstances be possible to do this; but it depends upon Prof. Boys' idea as to where the instrument should be used.

Mr. T. F. E. RHEAD: I should like to ask Prof. Boys what will be the price of this instrument and whether it is possible to get it.

Mr. G. W. ANDERSON: Would the Gas Referees allow this apparatus to be used?

Prof. BOYS, replying to the discussion, said: I have at any rate this satisfaction, that I have had no bricks thrown at my head metaphorically on this very drastic suggestion that gas should be sampled continuously. I did not know how that revolutionary proposal would be received, but, as I have said, it is no more than in the air. Mr. Whipple asked about the use of kieselguhr. I know that material quite well, but I have not tried it; at the same time, I do not myself think that as a non-conductor of heat it is better than compressed cork. So far as the moisture question is concerned, speaking as I did this afternoon, and depending upon the exuberance of my own verbosity, I naturally forgot to say many things that I intended to say. One of them was that the whole of the cork insulation inside the box type is absolutely removed from all possible contact with water. You might spill water on the calorimeter, but none would ever get anywhere near the cork. Thus the question of the cork being made damp does not arise. And, after all, if kieselguhr is made damp, I do not think it would insulate heat as well as if it were dry. Again, I forgot to say, in connection with this gasometer, that there is a sprocket chain which goes round a sprocket wheel. This wheel is not fastened to one of the clockwork wheels, but is connected by means of a clutch. I have used the same principle of a clutch which we had forty years ago in the old Cheylesmore tricycles, in which the wheel is free one way, but is instantaneously gripped the other way. In that case there were four rollers, one of which was always in a position to grip. I have made up something of the same kind here, and I have put in four $\frac{1}{16}$-in. steel balls, and one of them is always ready to grip, so that this bell can rise only so fast as the clock says it shall rise, and no faster. This answers the other question that was asked by Mr. Wood, as to the rate at which the bell rises with the gas fed into it from the holder through a governor. All this I forgot to say when I was speaking just now. Therefore, it is dealing with live gas, and not dead gas. This gas comes in at the pressure determined by the governor, and the clock determines the rate at which the bell rises. When the gas examiner comes along, and wants to test the gas, he pays no attention to anything else, but turns on the gas from the holder. The gas bell is weighted to $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$ in., or to anything you please; and when the gas examiner wants to test the gas, he does not interfere with the clock. The clock goes on ticking away, and this clutch device does not prevent the holder going down. The only thing the holder cannot do is to go up any faster than the clock says it shall; and it is the clutch arrangement which makes it so easy to adapt any device for altering the rate according to the scheme. I have said "according to the scheme," because I think that all methods of altering the rate according to the actual output from the works—and in large works you have several holders—is a hopeless proposition; and I think if, instead of having a hard and fast rule, we adopt some other rule which will fairly well meet the case, no one will be inclined to quarrel. We can say that from 6 to 12 in the morning we will take gas at a quarter the rate, or we can say we will not take it at all—that is a workable scheme. We can, of course, say that we will have all the gas-meters in the Gas Light and Coke Company's works connected-up with an epicyclic gear, so as to draw all their records together, and connect them electrically with all the testing places in London, but it is no use talking in that manner. It must be a workable scheme, and a practicable scheme, which fairly meets the case, and that is what I am suggesting now. You can, of course, suggest anything as complicated as you like. Dr. Smith has asked why this apparatus is not suitable for large works as well as small works. I do not remember saying it was not. I said I was addressing my remarks this afternoon specifically to the case of the small country works. As a matter of fact, I think it would be extremely useful in large works; and from what we have seen of this instrument at present I should very much prefer to use it instead of the standard Boys calorimeter, and use the whole equipment as you see it here. Though I did not say it, we

have been making very careful tests in the Gas Referees' Office. Our technical staff have been at work making a number of tests; and the results given by this apparatus and the Boys calorimeter are absolutely identical. There are slight variations from time to time, but on the whole the results are practically identical. I should very much prefer that the large works would use this instead of the old equipment. I think I have answered Dr. Smith's other question about sampling the gas leaving the works. Dr. Parker asked about mercury, and said this holder was made of tin; but it is not tin. It is either copper or brass tinned, and it is not what we usually call tin—viz., tinned steel. I have no use for things that do not last. Celluloid, as far as we know, is perennial; and this plated brass or copper holder is perennial in so far as it will not rust and break through. That, of course, would not be possible with mercury, and it would mean using steel or iron, which would be heavier. It would probably mean acetylene or oxy-acetylene gas welding, which now has become quite an easy operation. It could be done, but there would be a little expense in the mercury; and I do not know whether it is worth while. I did not catch the name of the gentleman who spoke about the soluble constituents in the water, and the division of these constituents down in the bell and up again, and evaporation into the air; but it was evidently put by a chemist of experience. If you give it long enough, this will take place; but at what rate it will occur with any gas I do not know. We have not got to the length of giving this a three months' test; but it may be of interest to you if I mention another thing which I also forgot—that the only gas which we have been able to test, the Gas Light and Coke Company's gas, in Victoria Street, has shown no change at all after a fortnight's test. I had hoped, when I got this holder last year, to have had, by this time, particulars of many tests of longer and shorter duration. We started with the old box calorimeter with onazote, but we could not use it with the Boys calorimeter, because it does not hold enough gas. Moreover, the accuracy of the tests when using onazote with the box calorimeter were not reliable, because onazote was found to be not perennial, and it is only recently that we have got the instrument that you see on the table. There was one other question, as to whether the instrument can be obtained. I must refer you to the makers as regards this. I am certain that the people who make these things do not make them for fun. I believe they want to sell them, but I have nothing to do with that part of the business.

The President: I will now ask you to accord Prof. Boys a hearty vote of thanks for his lecture, and can only express the hope that this calorimeter will be evolved soon in a form in which it can be used practically.

Prof. Boys: I must thank you for receiving this paper in so favourable a manner. I may say that I began to have awful misgivings towards the end of last year, when, after the lapse of six solid months, I wondered what I was going to do, because the onazote on which I had built all my hopes was gradually fading away. I did not know what would be the end of it, and so the time had to come when I had to do something. So I cut adrift my ships and went back to where I was two years ago; and here we are. [Loud applause.]

The President: With reference to the Rumford Medal of the Royal Society which has been presented to Prof. Boys, I, as your President, when I saw the announcement of that award, wrote to Prof. Boys and congratulated him. I am sure this action will be endorsed by all present. [Applause.]

A Furnace Repair Gun.

For the purpose of re-lining, patching, or surfacing furnace walls with great speed and at low cost, the "Quigley Refractory Gun" is being marketed by the Quigley Furnace Specialties Company, of No. 26, Cortlandt Street, New York. It is operated by compressed air, and with it refractory materials of plastic consistency can readily be applied to places not easily reached by hand-patching methods. Pre-mixed refractory material is placed in the gun. The nozzle is then pointed at the place to be repaired, and the gun operator, by handling the valve controls, forces the mixture from the gun through a section of hose to the nozzle, where the repair man makes the application. The pressure required will vary from 50 to 100 lbs., according to the nature of the material. The gun consists of a cast-iron cylinder, from which the material is forced by pressure applied to the piston. The gun has a capacity of 2 c.ft. of mixed material, and is mounted on wheels, so as to be easily movable from place to place.

Gas Oil.—The "Petroleum Times" reports that, dating from the 3rd inst., the price of gas oil is reduced by ¼d. per gallon to 5¾d., net and naked, *ex*-wharf.

Canadian Gas Association Convention.—A highly instructive and interesting programme of papers is announced by Mr. G. W. Allen (the Secretary-Treasurer) for the forthcoming annual convention of the Canadian Gas Association. This will take place in Quebec City, on July 15 and 16. The papers number 11 in all; and one of them is to deal with the subject of "Heating Vertical Retorts with Coal Gas."

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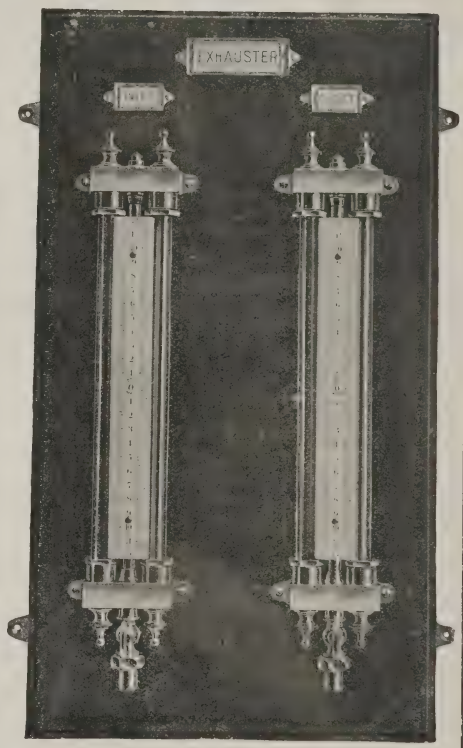

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NOTE ON TOWN GAS FOR MOTIVE POWER.

By SIR DUGALD CLERK, K.B.E., D.Sc, F.R.S.

Past President and Hon. Member of the Institution of Gas Engineers.

Town gas is by far the best fuel which has yet been produced for use in internal combustion engines. It is clean, it is uniform in its composition for each district, and its continued supply can be depended on; engines driven by it require a minimum of attendance and lubrication. Internal combustion engines of from 2 H.P. to 1000 H.P have used it successfully for many years. At present about 10 p.ct. of all the town gas manufactured and distributed in Great Britain and Ireland is used to produce motive power. The total power is approximately 360,000 brake horse, or about one-half of all the stationary internal combustion engines at work in our factories. The thermal efficiencies obtained are high; they vary from 25 to 30 p.ct. in the standard types of gas engines built by first-class makers. They are readily started, and can be relied on for long periods of service without breakdown of any kind. This is recognized by the small premiums required by the leading engine insurance companies.

Before the war the power of town-gas engines in use in all countries expanded rapidly. The war disturbed the trade, but now the industry is steadily recovering with the general slow recovery of the engineering and manufacturing industries of the world. The losses of war have, of course, impoverished all nations on this side of the Atlantic, so that our former customers abroad have too little money available to enable them to make their usual purchases from us. It is to our interest to trade with prosperous, not "poverty-stricken," nations, and we cannot expect to recover fully without the commercial recovery of other nations. It is our interest to help the recovery of our former rivals because they were also our former customers.

With the recovery of our overseas trade will follow that of our internal trade, and then the use of town gas for motive power will continue its war-interrupted increase. At present the balance of forces has been altered, and engineers are aiding recovery by the most rigid economy and economization of all available means of reducing the cost of motive power. Before the development of electricity, town gas enabled gas-engine builders to displace steam power up to about 100 B.H.P. At this power the lower price of heat evolved from coal burned directly in the boiler furnace balanced the higher-priced heat from gas notwithstanding the much higher thermal efficiency of the town-gas engine.

The pre-war cost of heat obtained from town gas varied from 2d. to 4d. per therm, while the heat direct from suitable coal was about 1d. per therm. The thermal efficiency of a small steam engine was never more than 5 p.ct., and that of a town gas engine never less than 20 p.ct., so that coal in a steam boiler would produce the same power from four therms which the internal combustion would produce from one. At about 100 B.H.P. a good steam engine will give about 8 p.ct. thermal efficiency, so that the fuel cost per B.H.P. falls below that of the gas engine. There is obviously a point when the fuel cost of gas for power exceeds that of steam due to the relatively rapid rise of efficiency with increase of steam-engine dimensions.

The gas-engine efficiency remains practically constant from 5 to 100 B.H.P., and this enables the smaller engines to work more economically than steam engines of similar power. Accordingly it is found that the great majority of town-gas engines at present in use are below the 100 H.P. limit. It is true that gas engines are run on town gas at powers of 150, 300, 450, and 1000 B.H.P. with complete engineering success, but the fuel cost is too great at the usual selling price of town gas to lead to general use in cities.

Many large engines are run on coke-oven gas for generating electricity for use at the pits, and many are used with blast-furnace gas which was formerly wasted or used most inefficiently under steam boilers.

Internal combustion engine builders are deeply indebted to the town-gas industry for the rapid development and success of their engines; they feel, as I have said, that no better fuel could be produced than good coal gas, and if it could be supplied at a sufficiently low cost per therm gas engines of every power would adopt it. At present, however, the price of 4d. to 6d. per therm is too high to compete with other sources of power above 100 B.H.P.

In order to develop a large engine trade it was necessary for engineers to attend to other means of obtaining motive power gas. This led to the invention and rise of the pressure and suction gas producer. In the suction form good anthracite and coke is completely converted into producer gas of from 130 to 160 B.Th.U. per c.ft. with a thermal efficiency of about 85 p.ct. The producer gas is admirably efficient in both large and small gas engines, and accordingly many thousands of horse power have been successfully operated within my personal experience at a cost for fuel less than that of coal gas. The producer, of course, adds to the cost of the power installation, and the attendance required costs more than that of a town-gas engine, but the total cost per H.P. hour is reduced.

Comparison of Cost by Town Gas and Suction Producer with Anthracite for 50 B.H.P. at 50 Hours Week.

Town gas at 2s. 6d. per 1000 c ft. and 475 B.Th.U. net value, or 6·3d. per therm. Heat consumption per B.H.P. hour = 0·0975 therm.

Cost of Gas per Week.	Interest and Depreciation on £350 at 10 P.Ct. per Annum.	Water.	Lubricating Oil.	Labour.
£ s. d.	s. d.		s. d.	s. d.
6 8 0	13 5	*Nil*	5 0	10 0

Total cost per week, £7 16s. 5d.

Anthracite fuel (suction gas), 1 lb. of fuel per B.H.P. hour at 50s. per ton.

Cost of Anthracite per Week.	Interest and Depreciation on £370 at 10 P.Ct. per Annum.	Water, 2 Gallons per B.H.P. Hour at 6d per 1000 Gallons.	Lubricating Oil.	Labour.
£ s. d.	£ s. d.	s. d.	s. d.	£ s. d.
2 15 0	1 1 11	2 6	5 0	1 2 6

Total cost per week, £5 7s. 8d.

When coke is used at 35s. per ton and a consumption of 1·25 lbs. per B.H.P. hour, the cost for the week falls to £5 3s. 2d.

A modern heavy-oil engine of the cold starting type calculated out on the same basis of a week of 50 hours and 50 B.H.P. developed during that time requires £4 18s. per week.

Diesel crude oil is to be used, and its cost is taken at £5 15s. per ton.

The total capital cost is £530, and at 10 p.ct. per annum this amounts to £1 0s. 4d. per week; in this case lubricating oil cost 5s. and labour 15s.

The costs stand thus:

	£ s. d.	d.
Town gas	7 16 5,	or 0·75 per B.H.P. hour.
Anthracite suction gas	5 7 8,	,, 0·52 ,, ,, ,,
Coke	5 3 2,	,, 0·49 ,, ,, ,,
Diesel crude oil	4 18 0,	,, 0·47 ,, ,, ,,

In the four cases the fuel costs alone are town gas, 0·61d. per B.H.P. hour; anthracite suction gas, 0·26d.; coke suction gas, 0·23d.; and Diesel crude oil, 0·51d. per B.H.P. hour.

In the case of electricity supply for power, allowing a motor efficiency of 90 p.ct., the current necessary to produce 1 B.H.P for each hour would require to be sold at 1·125d. per B.O.T. unit without making any allowance for interest on cost of electric motor, oil, or attendance. Some companies sell current for motive power at and near this low price—for example, Ashton-under-Lyne and Sheffield. To meet this competition it appears necessary to do everything possible to reduce the cost for power town gas to 4d. per therm. The demand for engines run by town gas would thus increase, and the gas consumption for power load would rise again as

before the war. In those times a considerable number of towns had reached the low figure of 2d. per therm; such towns as Widnes and Sheffield are good examples.

With the gas of that time 1s. per 1000 c.ft. equalled 2d. per therm and 2s. per 1000; a very common price was 4d. per therm.

In Sheffield now gas for power costs 6·4d. per therm. I do not suggest that the cost of town gas for motive power is the only element accounting for the reduction in the rate of increase; bad trade is largely responsible, but the price of gaseous fuel forms a large factor in determining the type of motor to be used. I have been long conscious of this fact, and I pointed out the importance of cheap town gas for motive power to the Gas Institute as far back as the Southampton meeting of 1902, and in 1905. I read a paper on "Coal Gas and its Rivals for Motive Power" to the North of England Gas Managers' Association. In this paper I discussed steam engines, gas engines, and electric motors, and the relative costs, and I then said:

"Even at present prices, in most towns, gas motive power is very much cheaper than electrical motive power." I could quote cases which have occurred in connection with the business of the National Gas Engine Company when electricity at 2d. per unit has been replaced by them by gas, with the result that the cost of power was reduced to about one-sixth, and this with gas at 1s. 9d. per 1000 c.ft.

There is no doubt whatever that both electric lighting and electric power companies are pressing hard to supply motive power; and a certain field will doubtless always be theirs. For powers up to 5 or 6 horse, occasionally used, no doubt they will find a considerable field; but if equal pressure were applied by gas companies, in conjunction with gas-engine manufacturers, I am convinced that the electric lighting companies would be prevented from seriously invading the field of larger powers. Even the very small gas-power trade might be held against the electric companies if gas companies would combine to let out gas engines on hire in the same way as they so commonly deal with gas stoves. The electric companies adopt similar methods; and there seem to be no good reasons why the gas companies should not fix gas engines in the same way as the Tyneside Supply Company, in Newcastle, fixes motors—either on simple hire or else on the five years' purchase system.

I am glad to find that our distinguished President has started a system at Derby whereby the rate of installing gas engines is increased. I wish him every success.

I agree with him in feeling that the increase of the town-gas power load is very desirable both from the point of view of the gas companies and the general public. We are more fortunate now in the greater liberty allowed by law to the great gas industry to vary the methods of manufacture and the composition of the gas produced so as to combine in one gas supply a thoroughly good gas for producing light, heat, and motive power at a low rate per therm supplied. The increased use of town gas will prove a great boon to the whole of our population both domestic and industrial. It is, of course, important to the nation to study and develop the supply of light and heavy oil for motive power and heating. Both light and heavy oil engines have come into very large use for locomotion on land, on sea, and in the air, but when we consider that the total heat of the oil raised from the wells in the world is only about 4 p.ct. of the heat of the coal raised from the pits, it is quite evident that coal and its products, solid, liquid, and gaseous, still remain of the greatest importance to the present and the future of mankind.

Internal combustion engineers are fully alive to this, and accordingly they study and test every type of fuel found in the world, and have adapted most of them, including waste products, to the purpose of producing motive power by their engines. They have accordingly designed special types of internal combustion engines for various liquid fuels, such as petrol, paraffin, heavy oils, and alcohol, and for gaseous fuels derived from many sources, first of all and most important town gas, then gases of the producer type from anthracite, coke, bituminous coal, lignite, peat, wood chips, sawdust, cocoanut shells. Such woody materials are often available in other countries where coal or coal gas is not to be had.

I look forward with interest to the more extensive use of town gas for internal combustion engines in settled countries of our type, and to the further discovery of useful carbonaceous matter in the wilder countries which can be dealt with in producer-gas engines.

At the conclusion of the paper, Sir Dugald Clerk said: I see nothing in the world to prevent town gas engines being used in all sizes. It is simply a matter of cost. We gas engine designers and constructors would never have gone to the other gases had we not been forced to do so by the necessity of getting some fuel unit that was rather cheaper than the coal gas then available. If we could return to anything like the 2d. per therm of pre-war times, you would have an enormous increase in business. I do not suppose you can do it; but, if you cannot, you may get down somewhat. Some of the companies are down to 4d. a therm now, but 6d. a therm is too much. It depends on yourselves; and if you really feel that you ought to get the power load to increase your consumption, it can only be done by keeping the price fairly low.

Discussion.

The PRESIDENT: We are much indebted to our friend, Sir Dugald Clerk, for bringing the question of town gas for power purposes so well before us, and for giving us the actual facts. I am particularly glad that I was able to persuade Sir Dugald, who we know is extremely busy, to give us this paper, because no one in the country knows more about internal combustion engines than he; and we are much indebted to him, and to the gas engine builders, for the enormous steps forward that they have made of late years in connection with gas engines. I have taken a great deal of interest in the supply of gas for motive power purposes, and it has paid my Company very well. It is over 20 years ago since I decided to let out gas engines on 3, 5, or 7 years' hire-purchase. We fix them complete for a certain fixed sum per quarter. We have now gone a step further; and I am glad to know that it meets with the approval of such a distinguished engineer and scientist as Sir Dugald Clerk—there is no reason why gas engines should not be supplied on simple hire. It is very important that, if we are going to foster the supply of gas for motive power purposes, we should not only fix the gas engine, but take care to have that engine regularly inspected and indicated, so that we can guarantee to power users that they have only to telephone to the gas office, and immediately one of our experts will be on the spot to make any slight adjustments, so that they can rely on the gas engine working continuously, there being no danger of stoppage. I believe we have lost, in the past, a certain number of customers through gas engines, from various causes, breaking down, and there being delay in getting them put right. In these days, when manufacturers keep their factories going on full time for 50 hours a week, it is very necessary that they should be able to depend on the motive power they are using; and there is no reason why gas engines should not be installed, and why manufacturers should not be satisfied that there will no danger of any breakdown. I ascertained from the insurance companies the ratios of breakdowns with electric motors, gas engines, and steam engines; but as the returns are a few years old, I do not think it fair to quote them. The returns that I got, however, showed that the ratio of breakdowns with gas engines was less than with electric motors or steam engines. There is no doubt that in oil engines, and especially with the present low price of oil, and also in electric motors, we have keen competitors. There are certain places where the power required is small and intermittent, in which the electric motor is very suitable, but there are a very large number of cases, where the power is comparatively regular, where the engine would be running from 48 to 50 hours a week, and where the power is from 10 to 100 H.P., in which you could quite well substitute gas engines. But, as Sir Dugald Clerk has pointed out, it is essential that we keep our price for gas down as low as possible. We know that the electric supply companies have captured the power business through charging extremely low rates. They charge something like one-fourth of what they charge for lighting, and in some cases considerably less than that. I am not suggesting that you should go to these extremes, but I do suggest to you that it will be worth your while to make a cut as far as possible, and reduce the price of gas for power, to encourage the increase of the power load. There is, of course, no better load for a gas company than a power load running for 50 hours a week, winter and summer. I am certain that one of the results of this admirable paper this morning will be that the engineers of all gas-works will pay more attention to the subject of town gas for motive power. At Derby we have a clever skilled mechanic whom we obtained from one of the gas engine makers, and he visits factories regularly, and canvasses for power; and the results are most encouraging. I am afraid, with the small undertakings, it would not be possible for them to have a well-equipped power department, as the larger undertakings can; but as I suggested in my Address, I think it is a

case where the larger companies can co-operate, so that their power departments will be at the disposal of the smaller adjacent companies, and by that means we shall be able not only to benefit ourselves, but to benefit the manufacturers. At the present time trade in this country is in a deplorable condition, and one of the results is that manufacturers generally are being compelled to look at their costs. If you can convince them that they can reduce their costs for power purposes by the use of gas engines, they will be willing to consider the question. If you say to them, "We will put your engine down, and we do not ask you to pay anything except a small charge per quarter for hire or hire-purchase," then I am certain it will be an inducement in many cases to go in for gas for power. I do hope that the members of the Institution will see that we do not lose our power business without a struggle, and that it is our intention, if possible, largely to increase the use of gas for motive power.

Mr. GEORGE HELPS (Nuneaton): There is an old saying that "the best goods are wrapped up in a small compass," and here we have an example. I am in the happy position of being able to endorse every word that is in this paper. I see the great significance of it. I admire the wonderful mildness with which Sir Dugald Clerk bids us look to our methods. He has put the case before us much better than anyone with a bee in his bonnet, like myself [laughter], could; nevertheless, he gets home. He tells us what the costs of power are with gas at 6d. a therm, and there is a difference, you will see, between that and oil, of round about 50 p.ct. You will see for yourselves what that difference amounts to if you are selling gas at 1s. a therm, as most of us are doing. Sir Dugald Clerk tells us that, to compete with this power proposition, we should be selling gas at 4d. a therm. I myself, a short while ago, lost business because I could not sell at 3d., and I lost it to oil. He also shows us the effect of complete gasification, and shows us that the thermal efficiency of the producer to which he refers is 85 p.ct. That is very different indeed from what you read earlier in the week in a table where it was shown that complete gasification gave an efficiency of 69 p.ct. I am only sorry that Sir Dugald Clerk has not translated these figures into costs per ton of coal, but I am certain the only reason is because of his great consideration for your feelings. [Loud laughter.] He knows that he can bear me out that, if we take 1 ton of coal, we get 70 therms, or 700 B.H.P. The electricity people are getting 1000 B.H.P., and we can get it by complete gasification. Sir Dugald Clerk even refers to 2000 B.H.P. I am not going to bore you by discussing all these things, but these are the figures you have to look to. However, you do not want to listen to me further, and, as I said at the beginning, good things are wrapped up in small parcels, and sometimes quite useful remarks are uttered in a short time. I thank you for listening to me.

Mr. P. D. WALMSLEY (Great Yarmouth): There is one aspect of competition between electricity and gas which I am up against in my town, and that is that in some industries manufacturers must have electricity. They require it for the purpose of their businesses, (say) the weaving and textile industries—a small motor on each machine, which gives them a superior finished article. Therefore, I should like to have seen in this paper the cost of generating electricity by a gas engine, and afterwards supplying it to these small motors, and at what price we should have to sell town gas to compete in that way. There is another point in the paper which I think is lost sight of in a great many instances in competition between gas and electricity. The electricity people, in our case, supply as low as 1½d. per unit, whereas their actual generation costs alone at the generating station are 1·87d. per unit; and I would impress upon you the difficulties you are faced with when you are up against a proposition like that. The point is to ask their consumers what is the average price they pay, because many of them take electricity for lighting as well as power, and you will find that in many cases the charge for lighting is many times that for power. If you take the average costs to a consumer who takes electricity for lighting and power, I think you would find that in many instances it would pay the customer to put down a gas-engine electric generating set of his own. You should be able to convince many consumers that they can generate electricity by means of gas engines on their own premises cheaper than they can get it from a public electricity supply.

Mr. S. SHADBOLT (South Bank): The paper emphasizes perhaps better than many contributions we have had lately the absolute absurdity of the different methods of pricing gas and electricity; the absurdity being, of course, on the side of the electrical industry. The last speaker has given one instance, but coming, as I do, from the north-east coast, where we have super-power stations interlinked with systems of electrical distribution—which are, we venture to think, a great deal more to be feared than anything the Government is likely to promote—we find it is more acute still. In the general way, in active competition, we find that there is an unconscionable practice of absolutely fleecing the lighting consumer by the electric supply people, in order to under-cut the gas price to get power business. My own electrical competitor takes a bulk supply from one of the big north-east coast power companies; and not long ago a load came along in a pumping station for a water undertaking right outside my own gas-works. As a matter of fact, it was across the street, and the load was 100 B.H.P. for 8 hours a day. When the electrical people knew that I was after it, they went to the length of getting a special concession; and a special agreement was drawn up with their bulk supply people, which enabled them to cut the price to between 0·75d. and 0·9d. per unit. Yet the same people are charging 6d. per unit flat rate to all shopkeepers for lighting. We cannot compete with this, because I flatter myself that our industry has too much moral conscience, for one thing. On the other hand, one is sorry to have to admit that, though Sir Dugald Clerk rightly says it is a matter of cost when comparing forms of gas production—and cost alone, probably, for internal combustion engines—in electrical competition it is unfortunately with us a matter of cost and a good many other things when it comes to small loads, such as the convenience and adaptability of the individual drive. I am quite sure many like myself have found these to be more formidable points in competition than price.

Dr. E. W. SMITH: May I urge that gas engineers should not assume that the electrical industry is not moral because they adopt a system of the kind referred to by Mr. Shadbolt? I have been urging recently, and I do urge it at this meeting, that somebody, preferably the Institution of Gas Engineers, should start an inquiry in conjunction with accountants to consider what are the best commercial methods of selling gas. I am sure that a very good case can be put up for selling gas at 3d. or 4d. per therm at the present time by probably most gas undertakings. I am sure that it is absolutely uncommercial to sell gas for lighting at practically the same price as industrial gas, because domestic consumers are taking very small quantities, and there are high installation costs and so on. I do not need to go into that side of the thing at all, because it is one upon which we are all agreed; but there is no doubt that we shall lose a lot of business in the future, because the electrical undertakings are prepared to adopt systems by which the more the consumer uses the lower the price, to a very much greater extent than the gas industry is prepared to do. In such places as Manchester, where they have got what is known as the "Norwich" system—where electricity can be obtained for domestic purposes with a certain initial charge and at something like 1d. per unit afterwards—the fact that these people get away with it, and go on year after year, and make it pay, shows that they are not doing it for philanthropic purposes. They are not doing it to lose business, but they are doing it to gain business; and there is no question of immorality about it. It is business; and I do urge that an inquiry should be started to determine what are the practical means of differentiating between different charges for various purposes. I, personally, object to paying the top rate for gas when I use nothing but gas and coke in my own house, whereas the man next door, who uses no gas except a little for cooking, is charged the same rate.

Mr. S. SHADBOLT: The last speaker has reminded me that perhaps I allowed my feelings to carry me a shade further than I meant in using the word "moral." I meant that, when lighting consumers are over-charged, to subsidize power consumers who are directly under-charged, they are charged below the costs of generation, as has been proved. I consider, as a business proposition, that this is immoral. I was not alluding, of course, to high theology, or anything of that sort.

Mr. W. A. TOOKEY: It is needless for me to say that I have been extremely interested in Sir Dugald Clerk's admirable paper; but there is a saying that "fools step in where angels fear to tread," and I am going to dare to say that I think Sir Dugald Clerk has not been giving us quite a correct focus with regard to the rival methods of producing power. I think he will admit, when considering the figures of his table—I have only had the table a few minutes, and may be laying myself open to a retort which I shall thoroughly well deserve—that, particularly with regard to the production of producer gas from anthracite or coke, we can show for town gas a much better comparison, because the figures he has mentioned include no charges whatever for repairs or upkeep, so far as I read them. They include merely interest and depreciation on capital; but those of us who have had a considerable amount to do with suction gas producers will realize that the question of repairs should not be overlooked in comparisons of this sort. If this were not so, we should not find that so many users of suction gas plants, who adopted the fashion when it came in about 15 or 20 years ago, are now abandoning, in great number, these plants, and taking supplies of town gas, which they know is reliable and, all things considered, cheap. On the question of cheapness, I think that one cannot dissociate the question of service in connection with gas engines. I have been particularly interested in the President's remarks upon this point. I am not one of you gentlemen in the gas industry, as you know, but I am intimately connected with it, and I have first-hand information as to how town gas engines are working in various districts throughout the country. Only yesterday I was in a factory in London testing three small gas engines, each of them suffering from abnormal overloads; but, with all the difficulties of that kind, and the inefficiency which they meant, the owner told me that it paid him better to run these engines in that way to supply himself with electricity than to take a supply

of power from the public mains at the ordinary rates. Town gas has also been proved, in many districts in London, to pay in individual circumstances when proper accountancy methods have been adopted. Even kinemas find it very much better to make electricity from their own private generating plant, using gas engines; and there is always this advantage, that, apart from the convenience of town gas, there is the absence of standby losses, and the supply is ready at a moment's notice. There is also independence of industrial troubles from miners, railwaymen, and other people, because you have your eggs in your own basket, which is very much better than putting them in anybody else's; and this, of course, can be brought down to an £ s. d. factor of convenience *plus* cost. This is what I would recommend you gentlemen to study particularly. It would, of course, be inadvisable not to try to keep the charges for gas lower; but what I do, from my experience, offer to you as advice is that you should follow out the recommendations of your President this morning, and organize proper service for the engines working on gas. Then you will undoubtedly find your gas demand will go up, and particularly will it do so if you put the gas engine right down from the start, before the man has an opportunity to buy a second-hand gas engine from somebody else, which has already done useful service for a good many years, and has probably been erected by a man who is more like a plumber than an engineer.

The PRESIDENT: I am sure we are very pleased to have the remarks of Mr. Tookey; and I can endorse entirely what he says. In our case, if anybody wants to purchase a second-hand gas engine, we say that we do not recommend him to do it, and that it will pay him very much better to have a modern, up-to-date engine, because the saving in running costs and gas will be such that he will find it a better investment. With reference to Dr. Smith's remarks as to an inquiry concerning the selling prices of gas, that is a very difficult question; but I am certain that the British Commercial Gas Association will take notice of his remarks. If that Association can do anything to benefit the gas industry, he may be certain that they will do it. I may say that a number of gas companies, by their Acts of Parliament, are limited to a reduction of 25 p.c., for power purposes, of their selling prices for lighting. This, no doubt, can be got over, because, fortunately, under the Gas Regulation Act we have more elasticity. If we are to maintain the business, and increase it, the great thing, as Sir Dugald Clerk has pointed out, and as Mr. Tookey has emphasized, is that we must give service and reliability. This is the first consideration. Manufacturers want to be able to start their works at 8 o'clock in the morning, and run continuously until 5 or 6 o'clock in the evening, without any chance of breakdown, for 300 days in the year. We say in Derby that the manufacturers can do this, and, if there is anything wrong with their engines, within a few minutes our expert is at their works, and does what is necessary. I have great pleasure in asking Sir Dugald Clerk to reply to the discussion. I am not surprised that there has not been more discussion, because the paper is so complete, and has been dealt with by a master in regard to internal combustion engines. As Mr. Tookey seemed to be afraid to venture, I can quite understand you other gentlemen also being afraid.

Sir DUGALD CLERK: With regard to Mr. Helps, I am very pleased to find myself for once in agreement with him. We seemed to have some considerable differences a few years ago when I was President of this Institution; but now I am glad that he and I are to some extent in agreement. I notice that he still adheres to the fallacy for which he then stood up—namely, in taking the efficiency of gas production you must count the 70 therms that you get in actual gas, and, as you know, a ton of coal has about 290 therms total heat. That infers that you have lost 220 therms, but, of course, you have not lost the 220 therms, and that is where we differ. I allowed for the coke and the tar, and all the other substances that come into combustion; but Mr. Helps does not.

Mr. HELPS: That is purely a question of economics, and you are putting the case from the economical point of view. The coke very often costs more than you get for it. That is my point, but I do not think we had better start an argument.

Sir DUGALD CLERK: I do not wish to irritate Mr. Helps, but I do not agree that you should not take the therms from the total coal, and the total distribution of heat, which I have given you. You all know exactly my views on that matter, so I will not go into it any further.

Mr. HELPS again rose and endeavoured to speak, but was greeted with loud cries of "Order."

Sir DUGALD CLERK, continuing his reply, said: Mr. Walmsley has referred to the question of electrical distribution, and I agree that this enables you to put down separate motors. This is an enormous convenience in some works, and it is so great that the National Gas Engine Company, of which I have the honour to be a Director, have a central electric station driven by gas, partly by coal gas and partly by producer gas, and from that central station we are distributing electricity all through the works for cranes and machines and everything. I think the remedy for the state of things which Mr. Walmsley refers to is that, if you can sell gas at a suitable price, it will pay to generate electricity on the works by means of gas-driven machines. I have noticed repeatedly that this question of charging for electricity for power purposes arises. The figure given by Mr. Walmsley of 1·87d. per unit is about the average for the country, and, as he says, electricity is often sold at a 1¼d. for power. On the north-east coast it is sold at a lower price than this, but I understand the station costs there are lower. If you take the very large new electric power station in Manchester, the Barton power station, the efficiency of generation was proved by the Government returns last year to be 20·33 p.ct. That is, you have 20·33 p.ct. of the whole of the heat of the coal in the electric current. In some of the stations on the north-east coast it approximates to that, and you can even exceed it with a higher load factor. With regard to Mr. Shadbolt's remarks, I quite agree it is a pity that lighting consumers should be penalized for the sake of the power consumers; and it would be better if this could be avoided. The same thing applies in this case, of course—that you can meet many difficulties of this character by generating electricity on the premises. Dr. Smith, I think, is accurate in saying that it is very desirable that accountants should go into the matter of the financial division between the gas lighting load and the power load. I think it would be found, as he says, that there is a certain distribution of power load which you can with advantage supply at a lower price, for the reason which your distinguished President said—namely, that you have a steady weekly or daily load, and in that way there should really be no loss. In that case the superior morality of the gas industry over the electric industry would not be shocked by a lower price for gas for power purposes. [Laughter.] Mr. Tookey says, no doubt from his own experience, that I have not added to the suction gas plant the cost of repairs. I may say that the figures I have given you have come from the works. Possibly they may be taking an optimistic view, but so far as I can see they have no reason to charge that 10 p.ct. for repairs, which is really a very heavy charge, and I think you will find that the repairs are not so high as Mr. Tookey imagines. These are works figures, but I will go into them again to please Mr. Tookey.

Mr. TOOKEY: I am not thinking so much of works figures as users' figures.

Sir DUGALD CLERK: I cannot be responsible for users' figures, because users sometimes give you very surprising figures which, on investigation, often turn out not so accurate. I can appreciate Mr. Tookey's point, which he makes from a large amount of first-hand information, because he has tested many thousands of gas engines in actual work, as to the value of service. There is the necessity to readjust the valves and other things, to bring the engines up to maximum efficiency. Of course, the more recent engines are far more efficient than the earlier ones; and it is better for users who intend to put in gas engines to put in new ones, and not second-hand engines. I agree with both Mr. Tookey and the President on that point.

Mr. GEORGE HELPS: May I have half a minute now?

Loud cries of "No."

Mr. HELPS: Thank you very much. Good morning, gentlemen. [Loud laughter.]

The PRESIDENT: I know you will agree with me in thanking Sir Dugald Clerk for his very valuable paper. About a month ago I had a communication from Sir Dugald, who informed me that he had to go to Italy in consequence of Lady Clerk not being well, and he has been there for several weeks. Upon his return he was engaged upon some very important cases that occupied an enormous amount of time, and he was afraid that he would not be able to give his communication. I pointed out to him that this Institution would be intensely disappointed if he was not able to give this paper ["Hear, hear"]; and he then said, if it was the wish of the Institution that he should give a paper, he would do so. Therefore, we are all the more indebted to him for his very valuable communication, and I have the greatest possible pleasure, as President of this Institution, in proposing a hearty vote of thanks to Sir Dugald Clerk.

Mr. H. D. MADDEN (Cardiff): It gives me the very greatest pleasure to second the vote of thanks to Sir Dugald Clerk. It is not the first time that we owe a great debt of gratitude to him. Some of his investigations are standard works to which we refer whenever we want to strengthen our case, either in the conservation of coal or as regards the production of electricity. The paper is one, I think, which we shall take away and think over, because there are many points in it which we shall require to study in regard to power production.

The vote of thanks was carried with acclamation.

Sir DUGALD CLERK: Mr. President and gentlemen, I thank you.

THE ECONOMICS OF GAS PRODUCTION ON THE THERMAL BASIS.

By GEORGE EVETTS, M.Inst.C.E., M.Cons.E.

The passing of the Gas Regulation Act, 1920, has enforced a new basis of comparison in gas production, distribution, and finance. The word "enforced" is used advisedly, as it must not be overlooked that for many years previously the thermal basis had been given serious consideration by many gas engineers, who realized that the volume basis was no longer the sound method of comparing either working or financial results. These pioneers voluntarily accepted the new standard of assessment, and new developments were viewed from the thermal standpoint. In fact, some companies promoted legislation whereby gas was sold with a defined minimum calorific value.

The Standard of Calorific Power Order made the procedure so simple that many undertakings accepted the calorific standard, which conferred substantial benefit on those who were in a position to take advantage of it, and whose candle-power standard was 14 or over.

These were only milestones on the road of progress, however; and it is clear now that the universal standard of 500 B.Th.U. or the special calorific value prescribed in the respective Acts of Parliament of the pioneers did not give the necessary elasticity to enable an undertaking to get down to rock bottom in costs of production and supply. Immediately the need for elasticity in manufacture became appreciated and recognized, it was apparent that the volume basis of sale must give way to the conception of selling thermal units in a more or less condensed form, leaving the strength to be settled by each individual supplier. There were some who preferred gas still sold on the volume basis at a guaranteed strength, using the standard therm price only as a medium for the calculation of dividends, but this method would have destroyed the element of simplicity which now exists.

The therm provides the universal standard of comparison; and as the gas industry is marketing therms, this is the basis to which all costs must ultimately be reduced. Calculations based on the volume of gas or the tonnage of coal are only useful in so far as they deal with the plant or machinery handling such volume or tonnage, and to this extent affect the working costs. Finally all results and costs must be reduced to the therm. This is sometimes lost sight of when considering (for example) claims of rival carbonizing systems. A motor-car maker only considers the amount of steel used or number of employees engaged so far as such information helps him to calculate the number of cars which can be made; but all his prices and comparisons must ultimately come down to the costs per car manufactured and sold. Therefore, the gas maker must first consider the known or likely demand for therms, and calculate his requirements accordingly. He cannot boost or retard this demand to any appreciable extent by ringing changes on the calorific value. If this were possible, then the freedom which the Act allows would be a fraud on the consumer.

Many discussions have taken place on the variation in the volumetric sale due to changes in calorific value, and somewhat remarkable statements have been made to the effect that chosen typical consumers have used the same volume, or even less, of low-grade gas, compared with corresponding periods when a higher grade was supplied. It is difficult to criticize these statements without full knowledge of the facts, but the author is of opinion that they would not bear investigation.

Tests on individual appliances have proved that, within fairly wide limits, the efficiency is approximately constant, or, to use the common expression, "one B.Th.U. is as good as another." Sometimes we are expected to believe that one cubic foot is as good as another. Now, what is true in the individual must be true in the aggregate; the author has made inquiries into the records of typical groups of consumers, and has found that the results are most conflicting. Therefore any theory could be promulgated by picking-out certain cases for quotation.

In dealing with upwards of ninety cases of applications for Section 1 Orders, the author has formed the opinion that, broadly, the volumetric consumption increases as the calorific value decreases. In one illuminating example, the calorific value was 540 (or thereabouts) in 1913, and 375 in 1921. The sale in the meantime had increased by over 50 p.ct. In other words, 540 therms sold in 1913 had risen to 565 in 1921, and the thermal sale per consumer was practically unaltered. The example formed a useful comparison, since there had been very little building work, no violent fluctuations due to munition work, and there is one staple industry on which the prosperity of the inhabitants depends. The position in this particular industry was unaltered, and, therefore, the comparison could be based on stable conditions. In the case quoted, the records of typical consumers were of no value in leading to definite conclusions.

The basis of all calculations, therefore, is the demand for thermal units; but, having got so far, the gas maker cannot dissociate the volume from his considerations. The volume of gas is the vehicle or medium by means of which the therms are carried, and a therm is intangible unless associated with the volume. The manufacturer of gas must produce a predetermined volume, and the distributor is called upon to propel this volume up to the point of ignition, with a certain flexibility at that point, but very little flexibility between that point and the gas-works.

To use the simile of whisky, if a distiller were permitted to choose any grade of liquor he wished, and sell on the basis of proof-spirit, he would, in preparing estimates of cost, find it necessary to take into consideration the size of the bottles and cases he would need to market the liquor, and the cost of transporting it to the homes of the consumer.

In the gas-works, the producer is given a large range in the carbonizing plant, both in volume and strength; but at this point the flexibility ends when considered on the volume basis. Exhausters, washers, scrubbers, purifiers, gasholders, and works mains are limited in regard to volume. Taking the gasholders as a case for comparison, assume that the maximum daily demand is 10,000 therms (1·82 million c.ft. of 550 gas), gasholder storage of 1,600,000 c.ft. would represent 8800 therms, or 88 p.ct. of the maximum day, with a 550 B.Th.U. declaration; but if the quality were lowered to 400, the thermal storage would be reduced to 6400 therms, or 64 p.ct. of the maximum. In order to reach 88 p.ct., as before, additional storage of 2400 therms, or 600,000 c.ft., would be necessary—costing about £15,000. This would add 1·4d. per therm to the capital cost per therm sold per annum (based on 250 maximum days per annum). The same would apply to a lesser extent to the other items of plant mentioned.

In the distribution plant the volume of gas to be handled would also be increased, with the added disadvantage that the specific gravity would be higher; and the combined effect might be that mains would need to be increased in size, with the result that additional capital charges would more than neutralize any saving effected in manufacture by the reduction in calorific value.

In matters of selling and administration, therefore, cubic feet can be discarded, but in manufacture, distribution, and measurement, the volume must be considered in conjunction with the heat units contained in that volume.

The following factors must influence the choice of the declared calorific value, whether it be the first or a subsequent change:

(1) The grade likely to give most satisfaction to the consumers; the special demands (if any) of trade and industry.

(2) The class or classes of coal available, and the relative prices delivered.

(3) The relative values of coal, oil, and residual products.

(4) The capacity, type, and condition of the carbonizing plant—viz., the efficiency.

(5) The capacity of the remaining portions of the works plant.

(6) The capacity and condition of the distribution plant.

(7) The latest developments in carbonizing plant and manufacturing processes.

(8) The operating costs of the various types of manufacturing plant, either existing or proposed.

(9) Capital costs and rate of interest on money in cases where new plant is under consideration.

Circumstances differ so widely that it is impossible to state the relative importance of the nine factors enumerated. Fortunately, a close financial estimate can be prepared of the effects of the governing factors except those numbered 1, 2, 3, and 7. In the case of items 2 and 3, a close estimate can be made of the conditions at the time of making the decision. Item 7 can be estimated with a reasonable degree of accuracy based on known results elsewhere or on makers' guarantees, leaving only the first, to which no numerical calculation can be attached. Past experience is usually the guide, and the combined skill of the purchasing, manufacturing, distributing, and selling staff is necessary to arrive at the right decision.

These nine factors will now be considered in order:

(1).—The Satisfaction of the Consumer.

The experience of the past few years has enabled many companies to gauge accurately the calorific value which is most acceptable to the consumers. It has frequently been observed that complaints begin and end within a comparatively narrow margin of calorific value. Whether these complaints are due to the insufficiency of the trunk mains, service pipes, or pipes on the consumers' premises is of some importance, for, if the change in calorific value necessitates wholesale alterations to mains and services, then a change is obviously undesirable. The same applies to the frequency of naphthalene troubles. If a change effected in the method of manufacture with a view to the alteration of calorific value seriously increases naphthalene trouble, it would be unwise to contemplate the change. As far as the appliances are concerned, it may be accepted as a general proposition that, if the pipe leading up to the appliance is capable of dealing with the necessary volume of gas having the proposed calorific value, then the adjustment of the appliance itself is a comparatively simple matter within wide limits. The nipple can be adjusted, and the pressure at the point of ignition can be increased or reduced, in accordance with the grade of gas supplied.

As previously mentioned, in deciding upon a calorific value it must be assumed that the demand in thermal units will be fixed, and independent of the grade; the efficiency of the appliances is constant within wide limits of value, and therefore no consideration of increased or decreased total sales should affect the decision.

The financial effect of this is to stabilize the standing charges per therm, whatever may be the declared value. It is necessary to emphasize this, as the author has heard it stated that, as the standing costs per 1000 c.ft. of gas are not affected by the quality, the richer the gas the lower the costs per therm. This would be true if the same volume of gas could be sold, but the increase in calorific value would automatically reduce the volume, and the costs per 1000 c.ft. sold would be higher before the conversion to costs per therm. In other words, the standing costs per 1000 c.ft. are affected by the quality.

It is equally important, however, to choose a value which will result in the thermal units being conveyed to the appliances of all consumers at the rate necessary for efficiency. The time element is as important to the domestic as to the industrial consumer. Complaints are made that the gas is bad, but the gas official knows that the real complaint is lack of pressure, preventing the consumer from getting the thermal units per minute or per hour which he wants. The result is doubly bad—the gas sales are curtailed and the consumer is dissatisfied.

From the experience gained during the past five or six years, there seems little doubt that the higher the value, within defined limits, the greater the satisfaction, assuming that the appliances are adjusted to deal with the gas without the dirt and waste indicated by carbonizing-up. Reducing the value *might* cause difficulties, but increasing it should not.

(2).—The Class of Coal Available.

The question of coal must be associated with the values of residual products and the type of the carbonizing plant—viz., items 3 and 4 in the list of factors.

If cheap coal is procurable from neighbouring coalfields, and the plant is capable of dealing with such coal, then the volatile matter and ash content compared with the price is a useful guide only if the coke yield is satisfactory in amount and quality. As the value of residual products gets less, so do the gas-producing qualities of the coal become of increasing importance.

To trace the effect of reduction of quality in coal or coke, take a simple case of two coals:

(*a*) Producing 63 therms per ton, and costing 28s. 6d.

(*b*) Producing 70 therms per ton, and costing 32s. 6d.

Now, if in each case the bye-products fetched 67 p.ct. of the coal cost, the net coals would be:

$$(a)\ \frac{33 \text{ p.ct. of } 28\text{s. } 6\text{d.}}{63} = 1{\cdot}79\text{d. per therm.}$$

$$(b)\ \frac{33 \text{ p.ct. of } 32\text{s. } 6\text{d.}}{70} = 1{\cdot}84\text{d. per therm.}$$

If, however, the coke from coal (*a*) fetched 2s. per ton less, the difference is 1s. per ton on net coals, and 67 p.ct. becomes reduced to 63½ p.ct., and the costs would be:

$$(a)\ \frac{36\tfrac{1}{2} \text{ p.ct. of } 28\text{s. } 6\text{d.}}{63} = 1{\cdot}99\text{d. per therm.}$$

$$(b) \qquad\qquad = 1{\cdot}84\text{d. as before.}$$

Therefore, the balance would change in favour of class (*b*).

If residuals produce a very large proportion of the coal cost, then the question of therms per ton is not so important, and a cheaper coal turning out less therms per ton might be more economical. For instance, if 20s. per ton of coal carbonized were to be obtained for residual products in the case of either of two coals, then a good coal at 30s. producing 70 therms would be less advantageous than poor coal at 26s. producing 60 therms.

$$\text{Net coal costs for good coal} = 10\text{s.} = \frac{120\text{d.}}{70} = 1{\cdot}71\text{d. per therm.}$$

$$\text{Net coal costs for poor coal} = 6\text{s.} = \frac{72\text{d.}}{60} = 1{\cdot}20\text{d. per therm.}$$

(3).—Relative Values of Coal, Oil, and Residual Products.

From the last few remarks it is clear that immediately coal quality comes under discussion it is impossible to keep clear of the effect of residual products.

After remaining stable for a couple of years, coke has unfortunately decreased in price substantially during the past twelve months. The receipts for tar and liquor also compare very unfavourably with 1923. The amount of tar and liquor produced per ton of coal is of comparatively minor importance in the cost of gas, though the prices received can be by no means neglected, seeing that the net receipts amount on the average to ¾d. per therm.

As Mr. Evans has pointed out in his Cantor Lectures, the thermal balance-sheet does not assume full importance unless the financial value of the therm in gas, coke, and tar is considered. To quote an absurdity, a process giving 95 p.ct. efficiency would be of practically no value if only 5 p.ct. of the yield was in the form of gas. In fact, a plant with 50 p.ct. efficiency, of which 25 p.ct. was gas, would be better financially.

The following may be said to represent fairly the value in the London district at the present time:

Coal at 32s. per ton = 1·28d. per therm.
Coke at 30s. per ton = 1·28d. per therm.
Tar at 3½d. per gallon = 2·00d. per therm.
Gas cost into holder = 4·50d. per therm.

On this basis, every therm produced as gas is nearly four times the value of a therm in coke, and over twice that in tar.

The following would represent the commercial value of a process per ton of coal handled:

$$\text{Value} = 4\tfrac{1}{2}\,t + 18\,c + 3\tfrac{1}{2}\,g$$

Where t therms of gas are produced at 4½d.,
c cwts. of coke are produced for sale at 1s. 6d.,
and g gallons of tar " " " " " 3½d.

This short cut would only apply, of course, where the same qualities of coal are dealt with at approximately the same prices.

In considering the value of residual products in relation to coal, the gas engineer is so familiar with net coal calculations that he knows the figure to which coke can drop before it pays to make water gas, and also the figure to which it can rise before he need seriously consider the question of dropping his "make" in order to have more residual products to put on the market. There may come a time when he must change his point of view, and regard himself as a producer of coke and tar. He could then afford to reduce his make per ton up to the point where

the plant would no longer deal with the tonnage of coal, or the market no longer absorb the residual products. The advantage under the Gas Regulation Act is that this lower make per ton would be richer, and consequently a higher value could be declared; and if this condition of affairs showed any prospect of permanence, it would pay to increase the declaration.

During 1921 the author, in dealing with a small undertaking making less than 20 million c.ft. per annum, found that the net coals were *nil*, due to a good local market for coke and tar, and it actually paid better (even on the volume basis) to make 10,000 c.ft. per ton rather than 12,000 c.ft. This would become more pronounced when selling gas on the thermal basis.

In cases where the residual products yield is stable in quantity, the financial result depends on residual prices; and the usual return from bye-products may vary from 50 to 80 p.ct. of the net coals, dependent on the selling prices. In these circumstances it is clear that, in the case of coal gas, the cheapest method of manufacture is that which produces the largest number of therms per ton of coal (leaving water-gas reactions or any steaming or similar combination out of the matter); and such method would cheapen costs in so far as the amount of solid fuel dealt with (coal and coke) is accordingly reduced.

In reference to coal gas manufacture without steaming, the decision is a simple one, whether the calorific value or the cost of manufacture is considered. The relative value of coal, oil, and residual products comes more into the picture when the steaming of vertical or horizontal retorts is under consideration, in contrast with the manufacture of water gas as a second-stage process.

It may be accepted without investigation that, in normal times (in fact, any time during the past five years), coal gas is cheaper than water gas, and a low-grade gas is more costly to produce per therm than a high-grade, if the lower grade is a result of water gas admixture, either blue or carburetted. In the case of steaming, the thermal increase is made at the expense of the coke yield, but at no cost for wages, very little for repairs, and only a small addition for fuel in the absence of waste-heat boilers.

In reference to complete gasification, the margin becomes very much narrower unless the financial yield from bye-products is uniformly good. Take, for example, a plant yielding 66 therms per ton with coal at 32s. and bye-products returning 80 p.ct. of this cost. The net coal cost is 6·4s. per ton, or 1·07d. per therm. A complete-gasification plant producing only a little tar and 180 therms per ton would result in a net coal cost of gas of 2d. (or thereabouts) per therm. However, if the yield from bye-products is reduced to 60 p.ct. of the cost of coal, then the complete-gasification plant would be cheaper.

With regard to the costs of water gas admixture, it is simple to construct graphs showing at a glance the point at which it pays to make water gas, either blue or carburetted. The economics of carburetting will be discussed later.

The relative value of coal and residuals does not seriously affect the costs of production between narrow limits of calorific value, but is material in considering the relative costs between high and low grade, where the latter includes the carbonization of the resultant coke, or complete gasification in one stage. It can be readily appreciated that, with relatively cheap coal and dear residuals, the high-grade gas is the cheaper to produce, and, with relatively dear coal and low residuals, the lower grades become cheaper, whether made as a result of complete gasification in one stage, or by steaming, or by producing water gas in a separate generator.

With any given price of coal, complete gasification will not pay (taking only net materials into consideration) if more than 60 p.ct. is returnable for residual products. This figure is based on the following assumptions :

1. That the fuel for carbonizing in one stage is paid for by the tar, &c., from the process.
2. That 180 therms per ton of coal are obtainable from complete gasification, and 70 therms from retorting.

180 represents 100 p.ct. of cost of coal.

70 represents 39 p.ct. of cost of coal (*i.e.*, net coals).

In the same way, it can be deduced that, with coke standing at or above 80 p.ct. of the price of coal per ton, it does not pay to make water gas, basing the make at 42,000 c.ft. per ton for generators and blowers. As a general rule water gas does not pay if 55 p.ct. or more of the cost of the coal is obtained from residuals.

It may be stated, therefore, that a low coke market should encourage the production of lower grades of gas.

Cost of Blue Gas and C.W. Gas.

At first view, carburetted water gas is much more costly than blue gas; but the net materials *plus* wages do not represent the total cost of these gases. Given a carburetted plant, it is cheaper to make carburetted gas; but if the gases can be made in separate plants, the respective efficiencies must be considered. The following table shows how the costs of blue and carburetted gas would compare if all factors are introduced. The coke figures and oil figures of yield are taken from Dr. Parker's paper on "The Production of Different Grades of Gas," read before the North British Association of Gas Managers, in September, 1924.

	Blue Water Gas. 840 C.Ft. 292 B.Th.U. = 2·45 Therms.			C.W. Gas. 1000 C.Ft. 483 B.Th.U. = 4·83 Therms.			Typical Coal Gas.
		Per 1000 C.Ft.	Per Therm.		Per 1000 C.Ft.	Per Therm	Per Therm.
	d	d.	d.	d.	d.	d.	Coals. d.
Coke, 36 lbs. at 30s. ton	5 8	6·91	2·37	5 8	5 8	1·20	5·00
Boiler fuel, 10 lbs. at 20s. ton	1·1	1·31	0·45	1 1	1 1	0 23	..
(not necessary if waste-heat boilers)							
Oil, 1·84 gallons at 5¾d.	..	..	..	10·6	10·6	2·19	..
Wages and salaries . .	3·0	3 57	1 22	3 0	3 0	0 62	0·80
Purification	0·3	0 36	0·12	0 5	0 5	0 10	0·11
Repairs to water gas plant	2·0	2·38	0·82	2·0	2·0	0·42	0·85
Repairs to general plant	3·4	4 05	1·39	4·0	4·0	0·83	0·85
	15 6	18 58	6 37	27·0	27 0	5 59	7·61
							Residuals.
Less oil, tar, 0·2 gallons at 3d.	..	..	..	0 6	0·6	0 12	3 20
	15 6	18 58	6 37	26 4	26 4	5·47	4·41

Each gallon of oil adds $\frac{2·38}{1·84}$ therms = 1·29 therms.

In the above table it will be seen that, for an extra expenditure of 10·8d., we obtain 2·38 therms, or 4·53d. per therm, against 6·37d. per therm, as the original cost of blue gas.

Each penny reduction in the gallon of oil would reduce the cost of carburetted gas by 0·4d. per therm.

Each 2s. per ton in the value of coke accounts for 0·16d. per therm in the value of blue gas, or 0·08d. per therm in the oil gas; or 10s. per ton reduction in coke has only the same effect as 1d. per gallon in oil. The effect of 1d. per gallon drop in oil and 6s. per ton in coke would bring the coal gas equal in cost to C.W. gas, having regard to the increased cost of coal gas.

Therefore, if more therms are required from the combined plant, they are available in the water-gas plant, without one penny expenditure for capital, either in carbonizing or general plant, and at a cheaper rate than blue gas or gas very slightly carburetted. In the above table it is assumed that the additional thermal production is required, otherwise the fixed expenditure on wages would be divided over a smaller thermal output, and consequently be of no financial advantage. The table is also based on the assumption that the blue gas is made in a carburetted plant. If not, then the coke figures must be adjusted to the probable consumption. Such adjustments would only affect the difference; and it may be assumed that the cost of obtaining therms by carburetting will always be cheaper than the original blue gas. It is seen that, for carburetted gas, coke per therm is about half as much as for blue gas. The capital costs are not included in the table, otherwise the difference would become greater.

To sum-up briefly, therefore, it is safe to assume that, on present costs :

(*a*) Coal gas is cheaper than either blue or carburetted water gas.

(*b*) Carburetted water gas is cheaper than blue gas, into the gasholder.

(*c*) Complete gasification at 180 therms per ton is equivalent to coal gas when 60 p.ct. of the cost is obtained from residual products (after adjusting for fuel for carbonizing in the former).

(*d*) The cheapest coal gas to make is that giving the most therms per ton of coal in normal circumstances.
(*e*) The above factors tend to produce cheaper costs in higher declared values.
(*f*) Low coke prices tend to lower calorific values.

(4) and (5).—THE CAPACITY AND TYPE OF EXISTING PLANT.

As previously mentioned, the plant must be considered in conjunction with the prices of coal and residuals. A 100 p.ct. coal gas might be the right thing on paper; but if the coal gas plant is incapable of producing the full requirements, then the figures are only of value when considering the desirability of erecting additional plant for coal gas. The relative costs of the past two or three years have proved the desirability of having sufficient coal gas to meet total requirements. Everyone has not been in this fortunate position, but the lucky ones have been able to save at least the capital and sinking fund charges on water gas or extraneous plant used only in emergency. The emergency value of water gas must not be overlooked, and it is good practice and good economics to use retort houses or sections of retort houses to their fullest extent, producing thermal units with such labour engaged as is necessary and no more than necessary for the complete unit. Emergency demands or even seasonal demands of short duration can be met most cheaply by making water gas of value approximately equal to the coal gas.

The type and condition of the plant are generally the decisive factors in arriving at a decision on the nature and quality of the gas; but, in spite of this, there are comparatively wide limits of calorific value open for choice. Practically any known system has a variation of over 100 B.Th.U. per c.ft. The condition of the plant must be taken into consideration, but the performance in any set of conditions can usually be closely estimated by the responsible officer.

The maximum production of therms per ton is not always the cheapest method of production when everything is considered. One therm of gas is as valuable as $\frac{1}{6}$ to $\frac{1}{4}$ cwt. of coke, as it is produced at no increase in the labour costs, and very little for repairs. It is possible, therefore, that the maximum make of therms per retort in the house may be more economical than maximum therms per ton. The models prepared by Mr. Evans in his Cantor Lectures showed very clearly the thermal value of the gas produced at all stages of the distillation process, and it was obvious that the last two therms or so might easily be made at the expense of throughput or to the detriment of the ultimate cost of gas. When the volume only was of consequence, the additional gas appeared of more importance.

In a recent case in the author's experience, an undertaking was getting short of carbonizing power on the coal gas side, and water gas was more costly to manufacture. The problem was to increase the throughput of therms per day; and it was decided to face the consequence of reduced therms per ton. The duration was consequently changed from 12 to 8 hours, and the charges reduced by about one-fifth. It was anticipated that the make would be reduced by about 3 therms with an increase in coke for sale, due to the fact that the fuel required would not increase correspondingly with the coal throughput. The comparative figures of coal carbonized were :

Before the change, 2 per day × 12 cwt. = 24 cwt.
After the change, 3 per day × 10·5 cwt. = 31·5 cwt.
i.e., an increase of 31 p.ct.

The therms per ton dropped from 72 to 68½, but the coke increased from 10 to 10·6 cwt. for sale, as the fuel in the furnaces was not increased by more than 5 p.ct. The make per retort in therms, therefore, was increased from 1·2 × 72 = 86·4 therms to 1·575 × 68½ = 107·9 therms—an increase of 25 p.ct. After equalizing coal and residual prices, it was ascertained that there was a slight saving per therm on the repairs and wages, with the result that the gas into the holder cost 4·5d. per therm after the change, compared with 4·63d. per therm before. This is not a substantial saving; but the percentage of coal gas was increased from 75 to 87, and the total cost of the mixed gas is as follows, again adjusting prices to the same level :

Before.	After.
75 p.ct. coal gas at 4·63d. = 3·41d.	87 p.ct. at 4·50d. = 3·91d.
25 p.ct. water ,, at 6·07d. = 1·52d.	13 p.ct. at 6·07d. = 0·79d.
4·99d.	4·70d.

Hence the total over-all saving is 0·29d. per therm, and the increase in output has postponed for three years a capital expenditure of at least £25,000, representing 0·17d. per therm in interest and sinking fund over the whole output.

In another case the declared calorific value was 475 B.Th.U., and the quality actually made about 485. The maximum daily production was 1·9 millions, or 9125 therms on the made value; the annual make being 2,210,000 therms. The question of increased carbonizing power was under consideration, as well as a proposal to increase the calorific value, with the result that costs were closely investigated. The maximum working power of the retort houses was 7900 therms, with one empty arch for 8 through retorts for further development, leaving 1315 therms made in the water gas plant by 400,000 c.ft. of 340 B.Th.U. gas. Eight-hour charges were in operation, and it was ascertained that no further savings or increase of throughput could be obtained.

The next step was to ascertain the cost of increasing the calorific value by maintaining the thermal make of coal gas, but taking-up the increased sale by raising the declared value from 475 to 500, or the quality manufactured from 485 to 510.

The comparative figures worked out as follows :

—	A. 475 Declared. 485 Made.	B. 500 Declared. 510 Made.
	Therms.	Therms.
Annual make coal gas . . .	1,900,000	1,900,000
Annual make water gas . .	310,000	424,000
	2,210,000	2,324,000
Increase	..	5·2 p.ct.

The additional therms from water gas amount to 114,000, and the plant was capable of producing this without increased labour, by the addition of oil; and at 1¼ therms per gallon the cost was $\frac{114,000}{1\frac{1}{4}} \times 6\text{d.} = £2280$ per annum, or 4·8d. per therm made, which was less than the cost of the gas then being delivered to the holder. The over-all saving was estimated at £810 per annum. The actual increase in sale during the succeeding year was 5 p.ct., so that the additional bed of retorts was not required, but was set for the following winter, raising the coal gas power to 8500 therms per day. A further increase in the volume of water gas was contemplated, the cost per therm of which would be a little less than the water gas then being made. With a further slight increase in the calorific power of the water gas, the power of the works would be :

Coal gas	8,500 therms per maximum day
Water gas	2,750 ,, ,, ,, ,,
	11,250 ,, ,, ,, ,,
Compared with . . .	9,215 therms originally, or an
Increase of	22 p.ct. (say) four years' growth.

Since these estimates were made, however, the disparity between water gas and coal gas costs into holder has been increased, with the result that, if all coal gas could be made, the cost would be about 4·76d. per therm, and if made according to the above programme, the cost would be 4·97d. per therm—a difference of 0·21d. per therm.

The carbonizing plant proposed would obviously have to be built too large for immediate necessities, and the total cost would be approximately £22,500. The interest charge would be £1460 per annum, or 0·16d. per therm. So that, instead of producing a saving as originally anticipated, the increase as water gas is proving a little more costly, as the point has been passed where the increased thermal make can be effected by the mere addition of oil. However, the difference is even now only 0·05d. per therm more than the interest on the estimated capital expenditure, so that the programme has not been a failure.

If the existing plant were inefficient, and a new plant offered distinct advantages in efficiency and running costs, then a new factor would be taken into account; but this was not the case in the plant referred to.

With reference to the efficiency of carbonizing plants in general, they must be judged entirely on their merits according to known results and the proposals put forward by competing contractors; but it may be of interest to investigate the financial results of the methods of carbonizing summarized in Dr. Parker's paper to the North British

Table of Net Coal Costs.

No.	Method of Carbonizing.	C.V. of Gas. Gross.	Gas per Ton. Therms.	Coke for Sale. Cwt.	Tar. Gallons.	S/A. Lbs.	Net Coals per Therm. A.	Net Coals per Therm. B.
							d.	d.
1	Verticals, very light steaming	500	57	9·5	15	34	2·53	2·91
2	Verticals, steamed	400	95	6·7	20	42	1·82	2·02
	Extra 38 therms obtained for (per therm)						0·75	0·68
3	Verticals, no steaming	544	71·3	9·25	9·3	16·3	2·48	2·75
4	Verticals, 20 p.ct. steaming	460	103·8	7·5	12 4	21·2	1·89	2·04
	Extra 32·5 therms obtained for (per therm)						0·57	0·52
5	Horizontals	600	58	8·1	10·6	26	3·24	3·53
6	Horizontals and self-steaming B.W. gas	392	126	..	10·6	26	2·75	2 69
	Extra 68 therms obtained for (per therm)						2·15	1·97
7	C.W.G. plant, self-steaming	400	236 (1 ton coke, 59 gallons oil)	..	7	..	2·87	2·75
8	C.W.G. plant, self-steaming	500	336 (1 ton coke, 135 gallons oil)	..	16	..	3·25	3·17
	Extra 100 therms obtained for (per therm)						4·10	4·15
9	London Companies' horizontals	535	70·6	10·8	9·6	26	2 05	2·35
10	Verticals	470	82	9·4	14·0	28	1·83	2·11
11	Verticals	450	85·7	10 0	17·2	30·2	1·58	1·85
12	Tully, complete gasification	340	180 (1 ton coal, 3¾ cwt. coke and breeze)	..	12	..	2·13	2 15
13	Robinson, complete gasification	380	170 (1 ton coal + fuel for steam)	..	12	..	2·23	2·25

Lines 1, 2, 5, 6, relate to Dr. Parker's figures on Lanarkshire washed nuts.
Lines 7 and 8 relate to Dr. Parker's figures.
Lines 3 and 4 relate to Fuel Research Board results adapted (Mitchell Main nuts).
Lines 9 to 12 are from published results.

	Column A. s. d.	Column B. s. d.		Column A. s. d.	Column B. s. d.
Coal per ton	32 0 ..	32 0	Tar per gallon	0 3½ ..	0 3
Coke per ton	30 0 ..	27 6	S/A per lb. profit	0 0½ ..	0 0½

No.	Method of Carbonizing.	C.V. of Gas. Gross.	Gas per Ton. Therms.	Coke for Sale. Cwt.	Tar. Gallons.	S/A. Lbs.	Net Coals per Therm. A.	Net Coals per Therm. B.
							d.	d.
14	Parker, low temperature	700	39·6 (1 ton coal, 3¼ cwt. coke and breeze)	13·9	18·6	1·78 gallons spirit	1·41	2·06
15	Maclaurin, low temperature	250	68·5 (1 ton coal, 1 cwt. breeze)	11·0	15·6	17	1·42	1·77
16	Nielsen, low temperature	425	94·5 (1 ton coal, 1½ cwt. breeze)	7·5	20·0	..	1·61	1·81
17	Marshall-Easton, low temperature	466 to 403	71·5 to 103·0	9·0 to 6·0	18·0	28	1·27 to 1·50	1·59 to 1·67

Line 14 is taken from Fuel Research Board results.
Lines 15 to 17 are taken from results published by inventors.

	Column A. s. d.	Column B. s. d.		Column A. s. d.	Column B. s. d.
Coal per ton	32 0 ..	32 0	Tar per gallon	0 5 ..	0 4½
Semi-coke per ton	35 0 ..	32 6	S/A per lb. profit	0 0½ ..	0 0½

Association of Gas Managers previously referred to, as well as other systems.

Two bases are taken, the second showing a lower return for residual products.

The first eight items in this table should be used for making comparisons only within limits. The Lanarkshire washed nuts produce only 9670 c.ft. of 600 B.Th.U. gas, or 58 therms per ton, with 8·1 cwt. of coke for sale, when carbonized in horizontal retorts. It would appear either that this is an unsuitable coal for horizontals or that the horizontal retorts were not in a good condition, for when carbonized in vertical retorts 9·4 cwt. of coke were produced, with 67 therms of gas.

The unreliability of the thermal balance from the financial point of view, even when dealing with the same system and plant, is shown in comparing lines 1 and 2. The thermal balances of these two are almost equal, whereas line 2 produces gas about 30 p.ct. cheaper than line 1, due to the therms in the gas being of more value than the therms in the coke.

It will be seen that the extra therms produced by steaming are much cheaper than obtaining additional therms either in a blue water gas plant or by carburetting; in fact, the steaming of vertical retorts probably represents the cheapest method at present known of obtaining increased output. The figures are on the assumption that the coke from the steamed verticals is of the same value per ton as unsteamed.

The results for low-temperature systems show-up very favourably on the prices given; and if the yields can be guaranteed, coupled with a market value of 5s. per ton in excess of coke for the solid fuel, there are decided attractions in most systems. In the last four calculations, a small part of the solid fuel is taken at breeze prices. The tar is taken at 1½d. per gallon more than in the first part of the table, to include the additional value of spirit obtained. There is a substantial increase, however, in the cost of gas for 2s. 6d. decrease in the receipts for the semi-coke. It will be observed that in the Parker process it amounts to 0·53d. per therm, compared with half this amount in vertical or horizontal systems. Similarly a penny loss in tar per gallon amounts to 0·47d. per therm in the gas, compared with 0·15d. in the case of the existing methods. Thus 2s. 6d. a ton difference in coke (say, half this amount in breeze) and 1d. per gallon in tar affects the cost of gas as follows:

Parker process ... ... 0·73d. per therm.
Verticals with 20 p.ct. steaming ... 0·23d. per therm.

There is little to be added regarding the capacity of the works plant other than carbonizing. Practically the whole of the plant outside the retort house is limited in capacity on a basis of volume; and consequently the richer the gas the more economical will this part of the plant be to construct, operate, and maintain. Fortunately, the capital or running cost does not increase in proportion to the volumetric capacity, and it is real economy to construct plant well ahead of requirements.

(6).—The Capacity of the Distribution System.

Distribution problems in relation to calorific value have been fully discussed by able writers, so that only a brief note is necessary. Whatever may be the differences of opinion regarding methods of manufacture, there is no

doubt that the high-grade gas is favoured by the distribution engineer, for the following reasons:

1. Less pressure is required to deliver thermal units in a highly condensed form, due to the less volume to be dealt with. Alternatively, the same works pressure gives a better pressure to the consumer.
2. The lower volume is associated with a lower specific gravity.
3. The higher grade keeps the mains and services more free from corrosion, and therefore their carrying capacity is maintained.
4. The higher grade is usually associated with a higher saturation point, and naphthalene is less troublesome.

There is no doubt, therefore, that economically the higher grade scores on all points.

It is frequently argued that the distribution difficulties can be solved by increasing pressure at the works, but the fact remains that with a higher quality the increased pressure would deal with still more gas, so that a main of given size has a reserve of potential power if the calorific value is increased. Boosting gives rise to unequal pressures, and 12 in. near the works coupled with a bare 3 in. at the distant points cannot be desirable.

The increase of the minimum pressure prescribed by the Act of 1920 is only of practical importance in certain areas, as the gas undertaking previous to 1920 always aimed at a pressure in excess of 2 in. in the service pipes. In the areas affected, however, the problem is none the less a serious one, and the cure is usually a costly one.

The importance of the quality is clearly shown by taking typical cases. In a paper read before the Public Works and Transport Congress in 1923, Mr. H. E. Bloor compiled a comprehensive list of gases supplied by various undertakings; and the lowest in the range was 290 B.Th.U., and the highest 564 B.Th.U. Adopting Pole's formula, the pressure drop along an 18-in. main 3600 yards long delivering 500 therms per hour is shown in the following table, and the delivery in therms per hour with a fixed pressure drop of 2 in. is also given, together with the next lowest gas in the list (412 B.Th.U.).

B.Th.U. Gross per C.Ft.	Sp. Gr.	Pressure Drop at 500 Therms per Hour.	Delivery with 2 in. Pressure Drop, C.Ft. per Hour.	Delivery with 2-in. Pressure Drop, Therms per Hour.
290	0·59	180 tenths	57,000	166
412	0·62	95 tenths	55,700	229
564	0·40	33 tenths	69,200	390

No comment is necessary; the figures point the moral.

In connection with the supply mains in general, increasing attention is being paid to distribution holders at outlying centres of population. It is frequently found that the maximum hour is one-seventh of the day, and that 60 p.ct. of the gas is taken in six hours. The construction of outlying holders at balanced pressure results in working the mains for 24 hours a day (16 hours feeding and 8 hours supplying), with the result that their capacity is more than doubled.

Taking an example within the author's knowledge, an outlying village six miles from the gas-works, taking about 25 million c.ft. a year, has a maximum day of approximately 100,000 c.ft., and the pressure at peak hours drops to 25 or 30 tenths in the main street. The mains at the gas-works are 24 in. reducing to 18 in., and the last four miles are in 12 in., but the demand in the first two sections is naturally heavy.

A new holder of 70,000 c.ft. capacity is under construction, costing £4000, and ensuring a pressure of 48/10ths in the centre of the outlying supply, whatever may be the demand in the principal district. If the demand in the principal district increases by nearly 100 p.ct., the position in the outlying district is still secure. A 12-in. main would cost about £2700 a mile; and, therefore, the holder is put up at a cost of 1½ miles of main with no boosting expenditure. This does not represent the full advantage, however, for the increased holder storage reinforces the works storage to exactly the same extent, and provides for an increased business of nearly 25 millions. Therefore, the increased capacity of the main has been achieved at what is, in fact, very little additional cost, with the accompanying advantage of a constant pressure independent of what is happening in the populous part of the district.

(7).—Latest Development in Manufacturing Processes.

The newest methods of gas production do not actually call for detailed examination until additional plant is required. It is rare that any innovation offers such an overwhelming advantage as would justify scrapping comparatively new plant. Gradual replacement is always accompanied with improvement, and the "old-fashioned" systems are improved from time to time, with the result that, where new plant is necessary, the comparison is not between the existing plant and the latest innovation, but between the latest in all systems. Fortunately for the capital account, partial reconstruction, or even repairing, can be utilized for improvements in existing systems. The four main factors to be considered are:

(*a*) Net coal costs.
(*b*) Capital costs.
(*c*) Repair and maintenance costs, usually dependent on (*b*), since a low capital cost is generally associated with low renewals.
(*d*) Wages and operating costs.

During the past few years two methods of carbonizing have been developed for town gas manufacture—complete gasification and low-temperature carbonization.

Complete Gasification.

There is no doubt that complete gasification has come to stay. It is flexible, and the two systems previously referred to can be utilized to produce gas of considerable variation. In all the points mentioned above, the costs, when reduced to the thermal basis, are low. In general, it may be expected that any process giving a large thermal yield per ton of coal handled will produce low operating and repairs costs per therm; and this is intensified where there is no solid bye-product to handle.

Mr. Robinson, of Harrogate, gives the repairs for his plant at 0·11d. per therm, against 0·21d. for the horizontals; and the wages at 0·2d., against 0·4d. for horizontals, presumably compared on the same basis.

The wages on the Tully plant at Halifax are given as 0·55d. to 0·6d. per therm, including carbonizing and clinkering.

Low-Temperature Carbonization.

Low-temperature carbonization has yet to prove its claim as an accepted business proposition in gas-works; but there have been substantial improvements in recent years. It is obvious that the success of any system must depend primarily on the willingness of the public to purchase the resultant fuel at a price which compensates for the lower thermal production; and, secondly, the capital cost and working expenses must be reduced. The former of these secondary factors is more difficult of realization than the latter, having regard to the large amount of coal to be handled and distilled in relation to the thermal yield.

Contrasting extreme methods, complete gasification offers low capital with gas yields amounting to 140 to 180 therms per ton. Low temperature pure and simple is the reverse, as the constructional parts must deal with a heavy throughput with a yield of only 40 to 60 therms per ton, with no compensating speed of distillation.

For this reason the trend of modern invention is in the direction of admixtures with producer and water gas; and it would appear that success is likely to be achieved on these lines, using the heat as far as possible for internal carbonization.

If the public can be converted to the advantages of smokeless fuel, there will still remain the competition between gas coke at (say) 8s. per ton less than coal, and low-temperature coke up to 5s. per ton more than coal. Experience has taught low-temperature advocates that there is no advantage to be gained by carbonizing poor coals with high ash content.

At the Smoke Abatement Society's conference at Manchester in November, 1924, there were three papers dealing with the subject; and an analysis of the claims made will be of interest. The author has not been able to verify the figures given; but the financial results based on the stated yields should encourage further investigation, especially if the respective sponsors will guarantee their results. If any or all are ready with a genuine business proposition, they will find the gas industry willing to give the matter serious consideration. The industry already possesses to a great extent the market for the solid fuel, and provides the only substantial outlet for the resultant gas. The local

market both for coke and gas is essential to the success of the system; and though the large plants erected in thickly-populated districts near the coalfield form a valuable and substantial first step, the solution of the problem nationally lies in the scattered gas-works, where the dual demand is already developed.

The three processes referred to are:

(1) The Maclaurin plant, which gives a typical low-temperature gas diluted with a larger volume of water gas (formed from the steam admitted to cool the coke) and producer gas (formed by the admission of air saturated with water vapour), the latter supplying the heat of carbonization.

(2) The Nielsen plant, consisting of complete gasification in conjunction with low temperature, by means of which raw coal is used to improve the value of blue water gas (made from the solid residue of one stage in the process), by a double distillation. The process is, therefore, in three stages, which the inventor considers as the latest development for using his plant for the purpose of town gas supply. It is of interest to note that Mr. Nielsen considers that, to be financially sound, the capital cost should not exceed 10s. to 12s. per ton of coal distilled per annum, working 365 days a year, and that the working costs, including labour, fuel for carbonizing, repairs, and depreciation, must not exceed 4s. per ton.

(3) The "Coalite" plant, which is low-temperature carbonization pure and simple in a single stage, presumably distilled by producer gas, or at any rate by a fuel produced outside, keeping all the solid residue for the outside market.

A fourth process is the Marshall-Easton system, which consists of a water gas generator coupled with twin vertical retorts. The special feature of the twin vertical retort is that in each retort there is a hollow shaft and a twin screw or helix mounted on each shaft. These screws revolve at a predetermined rate, with the result that the coal is lowered through the retorts at a fixed rate, and the layer of coal is never more than 4½ in. thick. Any desired percentage of the low-temperature coke can be used in the water-gas producer. The potential sensible heat of the blow gases is used for carbonizing the coal at low temperature, and waste-heat boilers are incorporated for steam raising. The blue water gas made is passed through the coal during the process of carbonizing.

It would appear that, unless a substantial proportion of the coke is gasified in a generator, there would not be sufficient heat for carbonization of the coal, without outside assistance.

The following table shows the results given, and the financial return, when taking coal at 32s. per ton, the solid fuel at 35s. per ton, oils at 5d. per gallon after deducting the recovery costs, and sulphate at £4 13s. 4d. per ton profit. The capital is calculated from the only figures available on a basis of 240 maximum days per year; and the author has made certain adjustments, in order to draw a comparison between the four systems and the gas-works method, where usually the "coke for sale" is after providing fuel for distillation, as well as works boilers, &c. It is difficult to get exact comparisons, as the coals treated are not the same in all cases.

—	Maclaurin.	Nielsen.	Parker (Coalite).	Marshall-Easton.
Capital cost per ton of coal per annum	34s.	19s. 6d.	37s.	18s.
Do. per therm per annum	5·96d.	2·48d.	11·21d.	3·21d.
Gas per ton	27,400 ×	22,250 ×	5,600 ×	15,320 ×
	250	425	705	460
Therms per ton	68·5	94·5	39·6	71·5
Net coal cost per therm.	1·42d.	1·61d.	1·41d.	1·27d.
Labour and supervision per therm	0·27d.	about 0·25d.	..	0·25d.
Repairs per therm	0·36d.	about 0·30d.	..	0·25d.

(8).—OPERATING COSTS.

Under this heading are included wages, fuel or power costs, and repairs. All are important; and it is possible for an increase in wages to counterbalance a saving in net coals when comparing two systems, and frequently a particular plant may be chosen on account of low wages and repairs together.

Wages.—Dealing with wages first, it is difficult to lay down any hard and fast rule, as the scale of operation differs in almost every case, and the cost is dependent on the full or partial employment of the plant. Minor variations in the value of coal gas cannot be said to influence the wages costs per therm. Generally speaking, it may be accepted that the expenditure in wages is more a function of the amount of coal handled and the number of charges, than of the thermal yield. In machine charging, the number of charges is of more importance than the weight of the charge. At the same time, certain general rules regarding wages can be followed respecting the type of carbonizing, among which are the following.

(*a*) Vertical retorts are cheaper to operate per therm than horizontals.

(*b*) The additional therms obtained from steaming are gained at less cost per therm than the straight coal gas, thus reducing the cost of the whole; and this would apply even with steam generated in an outside plant.

(*c*) Water gas is cheaper (even per therm) than coal gas of the same size output, if each plant is operated to the same proportion of its maximum production.

(*d*) The additional therms obtained by carburetting are obtained for practically no increase in wages, thus reducing the overall wages cost per therm.

(*e*) Wages in complete gasification systems should be the lowest of all, if the plant is properly designed and in proper working order.

(*f*) A decrease in the carbonizing period for horizontal retorts will lead to increased wages per therm, unless there is sufficient elasticity in the arrangement of shifts, or the increase in therms per retort compensates for the more frequent charging.

(*g*) As a general rule, the less the amount of solid fuel handled per therm, the lower should be the expenditure on wages.

Consider for a moment the last of these rules in relation to the manufacture of gas in horizontal retorts and complete gasification, and examine the amount of solid fuel handled per 100 therms.

Horizontal Retorts—

To retorts (coal)	20 cwt.	
From retorts to producers (coke)	2¾ ,,	
From retorts to dump (coke and breeze)	11¼ ,,	
	34 cwt.	
For 70 therms—*i.e.*, for 100 therms	48·6 cwt.	(1)
Resultant coke gasified (assuming the above handling of coke suffices to deliver it to the water-gas plant).		
Additional fuel to boiler, say	1½ cwt.	
carbonizing in the plant the remaining 9¾ cwt.		
Total	35½ cwt.	
Therms in resultant water gas = 24,000 c.ft. × 300 = 72.		
Total, 142 from 1 ton of coal originally—*i.e.*, per 100 therms	25·0 cwt.	(2)
If second handling required for water-gas coke	31·9 cwt.	(3)
Complete Gasification (One Stage)—		
To plant	20 cwt.	
To boilers	3¼ ,,	
For 180 therms	23¼ cwt.	
i.e., for 100 therms.	12·9 cwt.	(4)

It is clear, therefore, that double-stage complete gasification is certain to result in lower wages per therm than horizontal retorts alone, and that complete gasification in one stage must be less than either. The above proportion would not hold good, but the difference should be substantial.

It is difficult to get actual wages comparisons, owing to the different methods of allocation in existence. Taking "Field's Analysis" for 1924, the lowest is 0·274d. per therm for Leicester, and the highest 0·875d. per therm for Bradford. It is probable that items are omitted in Leicester which are included in Bradford.

With regard to the comparative costs of wages for coal gas and carburetted water gas, in the same publication the figure for water gas amounts to 0·45d. per therm, and coal gas amounts to 0·55d. per therm or thereabouts.

The following are recently published figures for carboniz-

ing wages per therm made, though they may not all be compiled on the same basis :

	d.
Verticals at Glasgow	0·38
Verticals at Glasgow	0·39
Verticals at Coventry	0·27
Horizontals at Coventry	0·41
Tully gas at Halifax	0·55
Horizontals at South Metropolitan, 1924	0·52
Horizontals at Newcastle	0·40
Robinson's plant at Harrogate	0·20
Horizontals at Harrogate	0·40
Low Temperature (Maclaurin's estimate)	0·27
Eastbourne, horizontals—machine-charged	0·58
Welwyn, hand-charged retorts	0·99
Pinner, hand-charged retorts	0 90
Pinner, water gas lightly carburetted	0 75

The above figures are comparable when dealing with the same works, but, as before mentioned, the expenditure in the printed accounts conveys no evidence that one method of carbonizing or one quality of gas offers overwhelming advantages in wages expenditure.

In the case of water gas, the wages per therm decrease as the amount of carburetting increases; further, the wages increase as the plant is used at a lower percentage of its maximum.

In machine charging, the therms made per charge are of primary importance. Hence the reduction in wages which can be effected by changing from 8 to 12 hour charges while retaining 8-hour shifts. It often happens, however, that the throughput is slightly reduced by this change; but in considering wages only, the reduced number of charges should result in a saving.

Another objection to the 4-hour break between shifts is the difficulty in regulating the quality and the additional work put on parts of the plant during the concentrated period of rapid gas production. With regard to all the overhead charges such as salaries, collection, and management and administration, the costs under these headings would not be affected by the grade of gas. The number of therms sold is for all practical purposes independent of the grade; and no change can affect the costs per therm, unless the calorific value were put so high or so low as to cause numerous complaints, which would result in additional clerical work and greatly increased inspection charges. There is as much danger in going too high as too low; but the responsible official is not likely, except in emergencies, to go to such extremes as would bring trouble of this nature.

Repairs.—In considering repairs, the term must be used in the widest sense—*i.e.*, the estimate must be based on the total provision which is to be allowed for maintenance, repair, and ultimate renewal of the plant in either its original form or replacement in a modern form.

Taking meters as a simple example, the maintenance pure and simple may be very small, and independent of the grade or quality; but the repair of leathers would certainly be more with a low-grade gas devoid of oily matter or with an excess of oxygen. The life would also be distinctly less, with the result that the effect on the costs would not be immediately apparent. In a very few years the repair and maintenance would mount up in the case of the lower grade, and in (say) 10 to 15 years the effect of the shortened life would result in an abnormal expenditure in replacements.

In making comparisons between different works and different systems we are again faced with the lack of a standard method of cost allocation. In works "A" certain men are allocated to wages; in works "B" the same class might be allocated to maintenance, making the wages for "A" appear high and the repairs for "B" correspondingly high. Further, one undertaking debits to residuals what another would debit to maintenance. This difference extends also to the materials and standing charges such as inspection and supervision.

An examination of the repair and maintenance costs of many undertakings will show that approximately one-half of the total is expenditure on wages paid to the employees of the undertaking in question; and there are certain items which would be independent of the quality of the gas manufactured, so that the cost per therm would simply be a fixed annual charge divided by the number of therms sold.

With regard to the maintenance, repairs, and renewals of the exhausters, washing plant, purifiers, and gasholders, it is clear that a low grade of gas would necessitate a larger piece of plant in each case; and consequently the fuel, oil, paint, and general attention would be more than in the case of a higher grade, and the cost of repairs and renewals would be higher. Consequently the higher the quality the lower the repairs and maintenance costs would be.

The estimates for the corresponding expenses for the carbonizing plant and coal and coke handling machinery are not such simple matters, however, though considerable assistance is given by the experience of the past, and certain basic considerations. For instance, for coal handling, the cheapest plant per therm would be that handling the least coal, and therefore the system producing the lowest cost in respect of this item would be that producing the maximum number of therms per ton. The same would apply to the coke plant. In both, however, certain fixed charges must be met, and the time element must be a factor, as a plant handling no coal or coke would require a certain amount of maintenance. Further, a large plant on a reduced tonnage would not show the same saving as a new plant of smaller size.

In the case of charging machinery, there are certain maintenance charges which are fixed amounts, and other variable charges dependent on the type of machine, and speed and amount of coal dealt with; but probably the heaviest part is that caused by the wear of the chain and portions which are put into the retort. Consequently the lowest cost of upkeep is that which entails the minimum number of charges put in the retorts for each 100 therms manufactured.

With regard to the retorts proper, higher heats entail higher repair charges; but the additional therms obtained by increased throughput and higher thermal make per ton may well compensate for this. The throughput of coal is dependent substantially on combustion-chamber temperatures; and in conjunction with this one must consider whether the charge can be adequately burnt-off in less time than that actually employed. In other words, high thermal yield cannot always be maintained in addition to high throughput. A more important factor in retort repairs, however, is the variation in the heat of the retort caused by the introduction of cold coal, coupled with the damage due to the insertion of the chain and pusher head. Consequently the least expensive method for each retort is that which gives the greatest number of therms per charge

In comparing types of carbonizing plant, the repairs of the simpler types of plant will obviously be less than those more complicated. Therefore the repairs to a water-gas plant or a complete gasification plant should be lower per therm than other systems, for two reasons :

(1) Less costly on account of the actual material in them.

(2) More therms produced per ton of coal or coke.

The size of the unit is of importance, for it is costly to throw-out a unit forming a substantial proportion of the daily make for a repair in a limited part of the setting. This causes wear and tear on the spare plant put into operation, and the expenditure on the actual repair is higher than it need be per therm of gas made. For instance, supposing a defect in a bed of horizontals necessitated resetting from charging-floor level. If a bed of ten throughs were involved, this might cost £450, whereas if the economic unit of the works is more like six retorts, the corresponding repair would only be £275, or thereabouts.

Capital costs are dealt with later, but the first cost has a bearing on the charge necessary for complete reconstruction or replacement due to obsolescence.

The effect of the annual charge for sinking fund based on a useful life of (say) 35 years would not be important when divided over the gas made annually. The difference between the cheapest and the dearest plant would not be likely to exceed 0·05d. per therm manufactured.

In dealing with existing plants, the rival claims of thermal make per ton, per retort per day, and per charge have to be considered. The following table is based on a make of 10,000 therms per day, with 23 in. by 16 in. retorts 20 ft. long, or (say) 18 ft. run effectively charged. The tons of coal used may be said fairly to represent the "net coal factor," the retorts at work the "capital factor." and the retorts charged per day the "wages factor." The "repair factor" would be a combination of retorts charged per day and retorts at work.

With a fixed combustion-chamber temperature, the distillation temperature would be higher when less coal is being carbonized in the retort; and consequently it is more

	64 Therms per Ton.			68 Therms per Ton.			72 Therms per Ton.		
	Hours.	10 Hours.	12 Hours.	8 Hours.	10 Hours.	12 Hours.	ours.	10 Hours.	12 Hours.
Tons of coal used (net coal factor) .	156	156	156	147	147	147	139	139	139
Thickness of charge (excluding scurf)	7·6 in.	9·1 in.	10·7 in.	7·6 in.	9·1 in.	10·7 in.	7·6 in.	9·1 in.	10·7 in.
Percentage of sectional area filled (excluding scurf)	56	67	77	56	67	77	56	67	77
Retorts at work (capital factor) . .	104	108	113	98	102	107	93	97	101
Retorts charged per day (wages factor)	312	259	226	294	245	214	279	233	202
Thermal make per retort	96	92·5	88·5	102	98	93	108	103	99
Thermal make per charge . . .	32	39·5	44·2	34	41	46·5	36	43	49·5

The table is based on 10 cwt. for 8-hour charges, 12 cwt. for 10-hour charges, and 13⅓ cwt. for 12-hour charges.

difficult to get the increased yield per ton from heavy charges without extending the time of carbonization. The ideal is to strike the balance by arriving at the quantity best carbonized in a given period, without losing throughput and burning fuel in an endeavour to knock out a further therm or so per ton. There is a danger of therms per ton becoming a fetish, as in pre-war days "high makes" per ton were deemed a virtue without any other consideration. If the high yield per ton could be got in eight hours, the repair costs of operating 93 retorts with 279 charges per day must be balanced against 101 retorts (say one more bed) with only 202 openings per day. The total differences, however, would be small and less important than those due to differences in the design of plant or the quality of materials and workmanship in the setting.

It has been claimed that deliberately lowering the throughput enables emergencies to be met, but it is doubtful whether it would not be preferable to adhere to the most economical retort-house working, and take up emergencies with auxiliary plant. In verticals, of course, steaming is of emergency value; and it is possible to increase the percentage of steam, and compensate for the lower calorific value, by using more oil in the water-gas plant. If there is no water-gas plant, then extra steaming does not offer any substantial attraction in this respect.

With regard to mains and services, it has been shown earlier that either larger mains must be used with a lower calorific value, or, alternatively, increased initial pressures. The capital costs of mains or operating costs of boosting must be taken into account; but only the repairs are for the moment under consideration. There is little doubt that the low grade causes increased running costs for maintenance and renewal of services; and the chief expense would arise in relaying services in a larger diameter, and replacing all services on the district on a larger scale when the first replacement is complete. The same would apply to mains. Therefore, even if the distribution system is capable of dealing with the lower quality, the system loses a potential margin for increase which it would possess if the calorific value were kept at a higher figure. There is no doubt, therefore, that the district repairs, as well as the over-all distribution costs, would be higher with low-grade gas.

With regard to the repair of meters, it will be admitted that any given size of meter is capable of registration of more therms with a high-grade gas than with a low. Consequently, if a substantial drop in calorific value were to take place, it might be necessary to enlarge some meters on the district, with a consequent increase in maintenance per therm sold. Reference has already been made to the increased costs of maintenance due to low-grade gases produced by "stripping" and other methods of manufacture.

At the same time, in many houses the meter maintenance is probably a fixed item, in which the time element is the principal factor; and, therefore, the cost of repair as a total would be independent of the calorific value, if kept within reasonable limits.

The best way to reduce meter repairs is to increase the annual consumption.

It is of interest to examine the probable maximum hourly consumption per consumer during the year; and the following table is compiled from information furnished by the engineers of the various undertakings concerned.

The figures of consumption per hour appear very low, and the table shows the further scope for increase in gas consumption in any type of town; and it seems to prove that a very large proportion of the meters on a district are of ample size. The great difference between the figures for similar industrial towns like Birmingham and Leeds is worthy of note.

Table of Maximum Day and Maximum Hour.

—	Max. Day. Thousands C.Ft.	Proportion of Yearly Send-out.	Maximum Hour. Thousands C.Ft.	Factor Day / Max. Hr.	C.Ft. per Consumer per Max Hr.	Therms per Consumer per Max. Hr.
Birmingham . . .	50,610	1/274	3,750 (48,007)	12·8	18·7	·088
Cardiff	7,507	1/338	897 (4,585)	5·1	18·3	·086
Commercial . . .	18,083	1/286	1,338	13·5	11·1	·053
Derby	6,271	1/338	480 (3,029)	6·3	12·2	·061
Gas Light and Coke Company . . .	166,000	1/318	12,300	13·5	12·9	·065
Harrogate . . .	1,824	1/355	127	14·4	10·8	·050
Leeds	13,861	1/313	925	15·0	7·6	·036
Pinner	631	1/273	60	10·5	13·6	·068
Sheffield	20,179	1/310	1,500	13·5	13·3	·066
South Metropolitan Company . . .	67,291	1/318	6,029 (42,117)	7·0	14·9	·083
Stretford	2,652	1/318	188 (2,590)	13·8	12·6	·060
Tottenham . . .	12,595	1/311	1,275 (8,738)	6·9	14·1	·070
Widnes	1,822	1/355	125	14·4	14·5	·072

Note.—The factor $\frac{\text{Day}}{\text{Max. Hr.}}$ relates to the day's send-out in which the maximum hour occurs.

In cases where the maximum hour does not occur on the maximum day, the send-out in the day comprising the maximum hour is shown in brackets.

An interesting note on the subject of maximum hourly consumption is given in the case of two undertakings of residential character. The maximum hour is no longer the Sunday cooking load, but (in the first case) the breakfast hours of a winter morning, caused by the combination of lighting, gas-fires, and cooker hotplates. In the second case it is on Monday morning, when the weekly wash is in progress.

To return to the subject of repairs, the repairs to cookers and fires would appear to be independent of the calorific value. The burning of gas involves the use of the cooker; and the cost of maintenance is dependent more on the type of appliance chosen and the treatment given it by the individual consumer. Inspection charges represent a proportion of the cost; and the care given to the original adjustment, coupled with the consistency of pressure and composition, is of more importance than the choice of the calorific value. Other things being equal, the repair cost is a function of time and gas consumed.

Therefore, the position under the thermal (as compared with the volume) basis is unchanged; and, as a rough rule, the more the appliance is used, the less is the upkeep per therm.

(9).—Capital Costs and Rate of Interest on Money.

This factor is of great importance when new plant is under consideration, as money is usually dear at the time the required plant is most expensive. The thermal output must be considered in conjunction with the annual interest and sinking fund (or interest and depreciation) charges based on the estimated useful life of the plant; and in making the choice the necessary expenditure to other parts of the plant (if any) must be considered.

Simplicity of design is of importance; and the plant should be capable of renewal in comparatively small sections, avoiding the renewal of substantial parts of the work, as the wear may be confined to small portions. The

size of the unit must be considered, as a section used at a small proportion of its output is costly. The capital and sinking fund charges should therefore be assessed on the estimated requirements, and not on the maximum capacity.

The following table gives approximate costs of a plant making 10,000 therms per day, including coal stores, coke and coal handling plant, generating plant, and preliminary condensation. The useful life is taken at 33 years (1 p.ct. sinking fund on 6 p.ct. basis), and the interest at 6 p.ct. If the nature of the plant necessitates a shorter working life, then the sinking fund must be adjusted accordingly.

The annual make is taken at 240 maximum days = 2,400,000 therms.

Type of Plant.	Cost.	Interest and S.F. per Annum at 7 P.Ct.	Interest and S.F. per Therm Made
	£	£	d.
Horizontal retorts.	40,000	2800	0·28
Vertical retorts	50,000	3500	0·35
Carburetted water-gas plant . .	26,000	1820	0·18
Tully plant.	30,500	2135	0·21
Robinson plant	42,500	2977	0·30
Parker low temperature	112,000	7840	0·78
Maclaurin ,, ,, ...	60,000	4200	0·42
Nielsen ,, ,, ...	25,000	1750	0·175
Marshall-Easton ,, ...	33,000	2310	0·23

From the above figures it is clear that the lower-grade gas is considerably cheaper with respect to capital; and this is to be expected where the process consists in the more or less complete gasification of the fuel. In addition to occasions when new plant is required, a change of calorific value may involve capital expenditure, or alternatively result in postponing it. Owing to the trend of markets, a lower calorific value may result in a great saving in manufacturing costs, but entail heavy capital expenditure in mains, services, boosting plant, or even storage plant. Therefore, the economic effect of this expenditure must be balanced against the savings. If the relative values of coal and residuals appeared to be stabilized at such a ratio that low-grade gas would be cheaper over a long period, then it is probable that the savings would not be swallowed-up by distribution expenditure; and if in the future the balance should be affected, then the money so expended would probably be fruitful in taking up increased business. Each case must be considered on its merits.

Coal Conservation.

It has frequently been asserted that coal is conserved to a greater extent by carbonizing systems producing a large number of therms per ton of coal, but the figures and conclusions drawn therefrom usually ignore the utilization of the solid fuel distributed. Consider two processes:

(*a*) One ton of coal gasified by producing 70 therms of gas and 10½ cwt. of coke and breeze for sale.

(*b*) One ton of coal gasified completely by producing 175 therms of gas; this process requiring also 3¼ cwt. of coke.

In process (*a*) the gas undertaking must carbonize 2½ tons of coal to manufacture 175 therms; but this amount of coal releases 26¼ cwt. of coke, or 29½ cwt. of coke more than process (*b*). By withdrawing this quantity of coke, the market would need solid fuel (coal) to the extent of at least 25 cwt.; so that process (*b*) requires 20 cwt. *plus* 25 cwt. = 45 cwt. before satisfying equal requirements, against 50 cwt. for process (*a*). The difference is therefore very slight. In many industrial applications the amount of coal would be at least equal to coke, so that the above figures do not overstate the case. If the withdrawal of solid fuel under process (*a*) resulted in an increased sale of gas giving greater efficiency than solid fuel, then the figures would be more favourable to process (*b*); but this cannot be guaranteed.

Wastage.

Wastage is of two kinds:

(1) That caused by incorrect adjustment of the appliances.

(2) That caused by the householder.

With regard to (1), there is little doubt that a very high calorific value is liable to lead to more wastage than a very low grade; and, of course, the consumer has no control, or at best only a partial control, over this form of loss.

With regard to (2) this falls under three main headings:

(*a*) Burners lighted unnecessarily.

(*b*) Burners kept on after the work is done, such as a boiling ring left on after the kettle has boiled.

(*c*) Taps turned on too full, causing the flame to reach round the sides of the vessel, or resulting in inefficient lighting of a mantle.

Wastage under (*a*) is merely a function of time, and is independent of the calorific value, as the thermal units per minute reaching the burner should vary only within narrow limits. The same applies to (*b*), for it cannot be conceived that the wasteful user will leave the burners on longer than is necessary with a high grade any more than with a low grade. With regard to (*c*), it is probable that more wastage will occur with a high grade, particularly in lighting; and this can only be cured by repeated advice and education.

With reference to leakage, it is probably unaffected by the grade. Low grade requires higher pressures; but a certain sized orifice would deliver no more thermal units in a certain time, as the increased volume lost due to higher pressures would contain less heat units per cubic foot. The unaccounted-for gas due to difference of temperature between the station meter and the consumer's meters is unaffected by the grade. The unaccounted-for gas due to loss in registration by defective leathers and mechanism is likely to be increased by low-grade gases, though it is difficult to estimate the effect in figures.

On the balance, therefore, keeping to a high grade will not increase the leakage and unaccounted-for, but a lowering of the value might have that effect.

Discussion.

The PRESIDENT: You will agree with me when I say that Mr. Evetts has given us a most able paper and a most comprehensive one, on which he must have spent an enormous amount of time gathering together the information he has presented to us in tabulated form, which will be of the greatest value to the Institution. I am glad to find so many here to listen to this paper; and though we have not much time to discuss it, I know there are several gentlemen here who would like to take part in the discussion. Mr. Marshall's name has been mentioned in connection with one or two processes, and I will ask him to open the discussion.

Mr. MARSHALL: We have had the privilege of listening to a most interesting paper, and I personally wish to tender my thanks to the author. As my process has been mentioned, and as the whole subject of carbonization, whether at high or low temperatures, is connected with the thermal basis, perhaps I may be permitted to criticize or traverse some of the statements made—not because there is any disagreement between us, but for the reason that the paper was in print before I had the pleasure of meeting Mr. Evetts and having a talk with him over the matter. This question of low-temperature carbonization has been exercising our minds for a great many years. I personally have been nine years at the work. I have put down a works at Battersea, and through this plant I have put 2000 tons of coal, representing samples from every quarter of the globe, and I suppose I have been able to tabulate, with Mr. Tozer, results which have never been tabulated before, as far as the yields of gas and oil are concerned. What we have been striving for is not alone to get a smokeless fuel, but to get an oil which would render us quite independent of the American imported oil or oil from any other part of the world. We have been successful in obtaining oils which are equivalent to the best American oil imported into this country, and from our oils we have been able to extract a petrol with which we have driven a motor-car 300 to 400 miles with results equal to the best petrol in the world. All this can be got easily from some of our best gas coals. The question is whether low-temperature carbonization can pay. My view is that it cannot as an entity. If it is to stand alone outside the gas-works, there is no commercial prospect for it at all; but if you can use the low-temperature process in combination with a gas-works, then there is a very great future, in my humble opinion, for low-temperature carbonization. First of all I might say that I have had charge of many high-temperature works, but honestly I have always felt that we were wrong. I have not, however, been in a position to prove it, or say very much about it hitherto, or do much to mend matters. As an individual, I felt that we were going beyond the limits of economy in pressing our retorts to 2200° Fahr., and I do not think any of us know what the last 3000 c.ft. of gas per ton costs in reality. I have often discussed the matter with my brother-in-law, Mr. Goulden, of the Gas Light and Coke Company, and he has sometimes agreed with me that we have got to the limit of

economy in high-temperature carbonization. But coming back to low-temperature carbonization, what I am proposing to do, and have done, is this. The retorts I have put up hitherto have been static retorts—*i.e.*, to charge at the top and discharge at the bottom, at intervals of four hours. Each retort contains 5 tons. There are three rings of holes one above the other, and the heat is taken from the periphery to the inner rings. I have a working plant at the present time in operation in Natal, and there is another one being erected in Japan; but I feel that this is not finality. We can work it very well with Natal labour and with Japanese labour, but such a plant would be absolutely impossible if we tried to work it with British labour. Therefore I had to start all over again. Some years ago I lectured at Manchester before the Manchester Association of Engineers, and I told them plainly that I saw through a glass darkly as to how far low-temperature carbonization would help the gas industry; and for some years after that the glass was always obscured. It was only through working the Tully plant that I arrived at some definite means which cleared my thoughts. Whatever we think of the merits and demerits, we must agree that we owe Mr. C. B. Tully an immense debt of gratitude for what he did; and though I have had disputes with Mr. Tully, I look upon him as one of the pioneers in a line of thought which, if followed up, will help us very much in the future. What I wanted to get at was to make the retort continuous. I did not care what type of coal was used, whether it was the stickiest coal in the world. If I could induce that coal to travel, I knew it would be all right. Therefore, I set to work to design a plant, and I have erected it in my own garden. I have got coal from the Walton and Weybridge Gas Company, which is the stickiest stuff I have ever handled, and a piece the size of an egg will swell to the size of a coconut. I have been able to compress that into a solid coke containing from 10 to 15 p.ct. of volatile matter, and I have been able to get that coal absolutely down the retort without the slightest trouble. Moreover, I have been able to get 24 gallons of oil, which is some of the most remarkable oil I have ever seen. I have brought a small bottle of it with me. It is so volatile and so inflammable that, if you put a knife into it and strike a match, it will flame up like petrol. I have 24 gallons of that from this little retort. The great thing is what we can do with low-temperature retorts. If we have to heat them with the coke we produce, it cannot possibly pay, because we must take account of the cost of that coke. Following Mr. Tully's idea, which has been carried on by Prof. Stauffe, of Vienna, if we can get heat from an extraneous source without paying for it, then we will possibly be able to carbonize cheaply. If we have a water gas plant, we shall have more heat than we require to carry out low-temperature carbonization. It means that the low-temperature retort will give the fuel for the water gas plant, which in turn will give waste heat back to the low-temperature plant. Mr. Evetts has raised the question of what proportion of coke we must take to carry out low-temperature carbonization. In high-temperature work we used 26 therms of heat to carbonize one ton of coal—*i.e.*, we use about 2,600,000 B.Th.U., representing 10 p.ct. of coke, to heat a high-temperature retort. If we take a low-temperature retort, we only want half that amount, or 1,300,000 B.Th.U., to heat the retort, if I use the whole of the coke, but I do not want to. I can use a quarter of that coke, and still get sufficient heat to do what I want. If I use a quarter of the coke, which is equal to 46 therms, and deduct from this the heat required for steam raising and running the turbine, and the coke used in the process of water gas making, I get supplied to the generator 11 therms; and 11 therms is almost half of 26 therms which I should want if I were operating a high-temperature plant. If I take all the coke, I get 15 cwt. from the low-temperature carbonization process, and this coke contains 10 p.ct. of volatile matter. I then deduct 18 p.ct. for steam-raising purposes, which leaves me a net amount of coke of 12·3 cwt. If I use all this coke, which is 1377·6 lbs., and take 30 c.ft. of water gas per lb., I get 41,310 c.ft. of water gas of 306 B.Th.U. value. Then from the low-temperature retort I get a fixed quantity of 5000 c.ft. per ton, of rich coal gas of 800 B.Th.U.—that is, 4,000,000 B.Th.U., or 40 therms. If you can do this—as I say you can—and you add those 40 therms to the other therms, then you are doing very well indeed. The result therefore is 41,310 c.ft. of water gas, which gives me 126 therms, and 5000 c.ft. of rich coal gas, which gives 40 therms, or a total of 166 therms per ton of coal, but I have no coke to sell. In addition, however, I have 24 to 30 gallons of oil per ton. The question of the value of this oil depends upon the volatile matter in it. In my experience of thousands of gallons I have found that for every 1 p.ct. of volatile in the coal, you obtain from $\frac{1}{2}$ to $\frac{3}{4}$ gallon of crude oil which will fractionate into petrol, light oil, heavy oil, lubricating oil, paraffin wax, and pitch; and the pitch is the most remarkable thing. It contains only $3\frac{1}{2}$ p.ct. of carbon. If I use half the coke, I get 20,640 c.ft. of water gas, to which has to be added 5000 c.ft. of rich coal gas, this quantity being fixed, whatever proportion of coke I use. Thus I get 25,000 c.ft. of gas in all, or 103 therms per ton of coal. If I take a quarter of the coke, I get 15,000 c.ft. of mixed gas, or a total of 71 therms per ton, and I get 9 cwt. of coke for sale in the latter case, or 6 cwt. if I use half the coke. The process is so elastic that you can get gas of from 306 to 500 B.Th.U. by regulating the supply of coke put into the generator.

DR. E. W. SMITH: One feels very tempted to follow up Mr. Marshall on this question of low-temperature carbonization; but as it is not to the point, I do not think I will say more than that the scheme which Mr. Marshall propounds—one in which the low-temperature carbonization process is to be wedded to a gas-works, and one in which the waste heat normally used for raising steam is to be used for heating the retorts—is not one which is attractive to the gas industry. Then there is another point. If such a process has no attraction to anybody outside the gas industry, we shall want a lot of convincing as to why the gas industry should carry the baby. If it is really of value as a low-temperature process—and Mr. Marshall is satisfied that low temperature is now an assured success—the gas industry will also want to be assured of success if it takes it up. There are one or two points in connection with the paper to which I should like to refer; and I think this is the type of paper that should be more general. I think Mr. Evetts would like to have accentuated that he does not desire to indicate more than tendencies in methods of looking at things. I think he makes that point time after time in a guarded way. These tables in the paper must not be taken as standard tables for comparison; they must be taken as being indicative of how to work out your own results for your own comparisons. I should like to ask Mr. Evetts whether there is a misprint where he gives verticals, light steaming, as 57 therms per ton. I think it would be very bad coal and very bad verticals if anything less than 70 therms per ton were obtained under these conditions. I think it is probably a misprint, but it just shows you how important it is when engineers and first-class accountants get together, to get down to relative values of different systems, that the primary thing is for the facts to be right, because a small discrepancy like that may vitiate the whole of the results. I do not say it is so in this case; but it is a point to be met. There is another point I should like to ask the author, though perhaps he has not gone into the matter in sufficient detail to be able to answer at once; and that is to have an evaluation in greater detail of the relative advantages of the two recommendations he makes. He advocates high-grade gas because of distribution, but he does not give us enough leading as to the comparison between the cost of distribution generally and in detail, and the cost of production and management. Then, later on, he strongly advocates, for other reasons, 360 B.Th.U. gas. He does not give this figure, but he supports complete gasification. Now, can he put these two things together, and say, from the point of view of the distribution of 500 B.Th.U. gas, that it will pay handsomely, and from the point of view of the production of 360 B.Th.U. gas, that pays handsomely.

MR. F. H. ROBINSON (Harrogate): Mr. Evetts states that as a general rule water gas does not pay if 55 p.ct. or more of the cost of the coal is obtained from residuals. At Harrogate last year, with a complete gasification plant, with the price of coal at 27s. per ton, I estimated that the cost of complete gasification would equal the cost of straight coal gas making when the price of coke was 10s. or 11s. per ton higher, and that means that, with coal at 27s. per ton, coke would be from 37s. to 38s. per ton for the cost to be equal on the two systems. When I state this, I am basing it on a complete balance-sheet, and not upon thermal efficiencies or anything of that kind—*i.e.*, to take so much plant of the one type and so much plant of the other kind, and bring the figures together, and see what labour would be required to work the two plants in conjunction, and add for repairs, and strike a complete balance to produce a certain cost. If you do not take a complete balance-sheet, I say that the figures are misleading in every case. If we take materials alone, ignoring other factors, we should have required a difference in the coke price of 15s. or 16s. a ton to bring the two costs the same. While on the question of cost, and the cost per therm, I feel it is too often the case that cost is the only thing considered, and that the poor consumer is left out of account, for the reason that, when coke is cheap and coal is relatively dear, the policy seems to be water gas, and you reverse the policy when the conditions are the opposite. But what is the consumer to do in the meantime? On the one hand, you are going to give him a gas of a certain composition, perhaps with 10 or 15 p.ct. of CO, while with straight coal gas you have about 7 p.ct. of CO, and the quality, composition, and specific gravity are completely altered, and all the apparatus of the consumer is thrown out of order. I think the policy should be to reduce the amount of coal you carbonize, and reduce the amount of coke you produce, and make yourselves more independent of the fluctuations in these markets; and by that means you will attain greater stability. That has been seen recently, particularly on the north-east coast. I have in mind a certain works where they have several thousand tons of coke on the works, which are the same size as my own, and where the policy in the past has been to make straight coal gas with large quantities of coke for export. But they are in a pickle

at the present time, owing to the state of the coke market; and if there had been some policy followed of the kind I have indicated, they would have been in a different position to-day. Mr. Evetts makes a statement with regard to the repair and wages costs on complete gasification plants; and after stating the figures for Harrogate, he adds "presumably on the same basis." That is so; the figures include everything from the time the coal leaves the coal seller to the time the final materials are put into the yard in the shape of coke and ashes. As to the value of two shifts per day *versus* three, we have worked in this way for the past nine years; and from our point of view there are several advantages. You have less repairs and maintenance; you have a reserve machine; you have a reserve for an unexpectedly heavy demand; and you have a reserve in plant capacity for future extensions. With regard to the table dealing with the consumption per consumer per maximum day and maximum hour, I rather join issue with the author, because I feel that this table may be misleading. The factor $\frac{\text{day}}{\text{max. hour}}$, to be ideal, would obviously have to be 24 hours; and taking Cardiff and Leeds, the former has a factor of 5·1 with a consumption per consumer of 18·3 c.ft. In the case of Leeds the figures are practically reversed, and it seems to me that Leeds is in the happier position, because their maximum consumption is spread over a greater number of hours. I should like to thank Mr. Evetts for a very thorough paper; and I feel that it should be read in conjunction with Mr. Carr's paper.

Mr. S. Shadbolt (South Bank): I think we must bear in mind that this paper is largely a collation of facts and figures from other people's working, and a reasoned consideration and statement of the case as Mr. Evetts views it. I speak as one on the other side, who, barring the slight stagger inflicted upon us by the coal strike of 1921, has for three complete financial years supplied a 400 B.Th.U. (gross) gas in my district, with very little variation and with a constant effort to stabilize, as near as one can, an ideal composition, and also with a close guard against unduly increasing the specific gravity. I have therefore made a few notes from that point of view. The author expresses the opinion early in the paper that thermal consumption will probably remain unaltered by varying the calorific standard. I am able to assure him, from actual observation of my own consumers, that, in the case of power consumers, you can almost work it out mathematically. You can get the volume which a man will burn on a steady load, just by simple proportion; but it is not nearly so reliable when you come to domestic consumption. Further on in the paper the author voices the opinion that I have uttered myself on more than one occasion—that there is considerable risk of wastage with the higher qualities of gas which is not there with the lower qualities. The author states: "Reducing the value might cause difficulties, but increasing it should not." My experience is that there should be no "messing about" with the value at all, because there are bound to be some difficulties. Then the question of high-grade gas and pressure is mentioned; and the author states that less pressure is required to deliver thermal units in a highly condensed form, due to the less volume to be dealt with; but for bunsen burner work you require more pressure to aerate your flame on the jet, because you want a bigger proportion of air. We have come across this in actual use. Finally, the author refers to wastage. He states that a certain size orifice will deliver no more thermal units in a certain time, as the increased volume lost due to higher pressures would contain less heat units per cubic foot. I am afraid he takes for granted a very finely balanced adjustment of pressures, which will never materialize in actual fact, and ignores the experience which many of us have met with—that with increased pressures you run the risk of sudden fractures. Both factors make any leak more serious, though, of course, they lead to a more rapid diagnosis and elimination of leakages. I have found in practice in my own area that an increase in pressure has been of assistance in keeping down the unaccounted-for gas. This leads me to my last point, which deals with the unaccounted-for gas in my district. For the last fourteen years the average unaccounted-for gas has been 5·65 p.ct. At the beginning of that period we were supplying 550 B.Th.U. gas, and for the last three full years, barring the coal strike period, we have supplied 400 B.Th.U. gas. During the first year of the fourteen years the loss was 6¾ p.ct., while last year it was 6·05 p.ct., and the average is 5·65 p.ct. There is an absolute case from experience which shows that the volumetric unaccounted-for gas need not be increased by decreasing the calorific value from 550 to 400 B.Th.U.

Mr. Watson (Doncaster): Is this with the same make of gas?

Mr. Shadbolt: It is the percentage volumetric leakage from the whole of the output. The works, of course, has progressed in fourteen years, as, I hope, every works has, and the output now is about 150 millions as against 100 millions. Taking the actual calorific value now, and before the war, while the leakage remains volumetrically about the same, the thermal loss has been reduced exactly 27·27 p.ct., and I think it is time that this point was observed.

Mr. Morland (Sydney): It has given me very great pleasure to attend these meetings. Unfortunately I have not been able to be present as frequently as I should wish, but the papers to which we have listened this morning are undoubtedly excellent. In the Colonies, of course, we do what we can to keep our methods and practice up to date, and we follow, as far as we can, English practice, unless we are able to discover something better ourselves. However, judging from my experience during this trip home and also other trips, I think that we in the Colonies are up to date in our methods. We have not yet adopted the therm system, because Parliament, unfortunately, has not permitted us to do so; but I anticipate that some day we shall be able to adopt the therm system, and we shall benefit in doing so. We have all sorts of plant in use in the Australian States—horizontals, verticals, and complete gasification plants—and we are working out for ourselves, as far as we can, the relative advantages of the different systems. In my works we make our gas by inclines, verticals, and water gas plant.

The President: Mr. Evetts refers in several parts of the paper to high quality and low quality gas. Perhaps he will tell us what he means by high and low quality gas.

Mr. Evetts, replying to the discussion, said: I daresay you have tumbled to it by this time that the use of these terms is empirical. Anything over 500 B.Th.U. I call high quality, and anything under 400 B.Th.U. I call low-grade gas. Between these figures I have not any opinion as to whether it is high or low. With regard to Mr. Marshall's remarks, he has given us a very interesting series of figures as to what his plant could do, and I beg to assure him and every other maker of gas plant in this country that the Institution of Gas Engineers and the individual members, if they see a guaranteed proposition for making a cheap therm, do not care what this is made from, or what the plant is made of. They will look at it, and consider it, no matter whether it is high temperature, low temperature, or complete gasification. The method is immaterial to us; we want to make a therm cheaply. My objection to Mr. Marshall's method of attack (if I may say so—I have told him this in correspondence) is that I do not agree with him in taking a piece of everything, and then combining it in his plant, and saying: "That is what I can do." For instance, he gives 30 c.ft. per lb. of coke as the production of water gas of 360 B.Th.U. It may have been done, but how many of you are doing it to-day in your works as a practical proposition? Mr. Marshall says, further, that the heat from a quarter of the resultant coke in the low-temperature plant is going to provide sufficient heat to carbonize the coal. I cannot accept this proposition. He then calculates on 15 cwt. of coke or low-temperature fuel. This, again, is a result second to none. In other words, where can you find your coal to give you 15 cwt. of coke, the 20 or 24 gallons of oil, the 30 c.ft. of water gas of 366 B.Th.U. per lb. of coke, and the resultant heat from a quarter of the coke to gasify the coal? Dr. Smith has pointed out one or two things. The figure he mentioned in the table of net coal costs is a figure from the Fuel Research Board, and it so struck me that I draw attention to it. This coal was Lancashire washed nuts, and produced only 9670 c.ft. of 600 B.Th.U. gas, or 58 therms per ton, with 8·1 cwt. of coke for sale, when carbonized in horizontal retorts. Obviously it is not a good coal, and I put it in to show you that, by steaming it down to below 400, even with that inferior coal, you produce an extra 38 therms of gas at ¾d. per therm for the additional manufacture. Dr. Smith's comments on what I intended this paper to be are perfectly true. I wish each case to be considered on its merits; and in this paper I wanted to indicate lines of investigation for you to follow up for yourselves. He also asked me whether I can say, on balance, what is the right thing to do, whether the advantages of high-grade gas more than correspond, in distribution, to the advantage in the works of the manufacture of low-grade gas, and he supplied the answer himself. Of course, I cannot tell you. Each case has to be considered on its merits; and I would warn anybody against taking any short cuts with these things. The only thing, as has been pointed out, is to get a parallel balance-sheet for system A and system B, and run it to the bitter end. Do not stop half way, and say that A is the better. There must be no short cuts. The financial result has to be followed to the end with the various methods. Mr. Robinson has questioned my statement that as a general rule water gas does not pay if 55 p.ct. or more of the cost of coal can be obtained from the residuals. That relates to net coal only. This paper is divided into paragraphs, and only considers the points strictly arising within those paragraphs, and the 55 p.ct. refers to the net cost of coal, and is calculated by the usually accepted means of ascertaining the cost of coal, and the usually accepted balance of prices between coal and coke. Mr. Robinson also raised the point about ringing the changes on the calorific value owing to the trend of markets, and the difficulties likely to be caused to the consumers by changing the composition and specific gravity. I point out in the paper that we must consider if any change in the calorific value is likely to affect the satisfaction of the consumers. If it is, then do not make it, no matter what it would have saved you. I do not think I have lost that point

altogether. I am much obliged to Mr. Robinson for giving us the advantages of the 12-hour shift, but he must have a plant capable of dealing with 24 hours' gas, as it were, in comparatively quick rushes. Mr. Shadbolt has been good enough to give us the result of his experiences just on the margin of what I call low-grade gas, the 400 B.Th.U. He also asked me what I meant by saying that reducing the value might cause difficulties, but that increasing it should not. I have in mind there that in the case of three particular companies we have eliminated trouble with the consumers by going up from 475 to 500 B.Th.U. It may have been that it was the pressure which was the trouble at 475 B.Th.U., but the difference in the number of complaints was remarkable when we started to work towards the 500 B.Th.U. We first went up to 485, then to 490, and then to 495, all the while with a declared value of 475, and then we went up with our declaration when we were over 500 B.Th.U. In two cases out of the three the number of complaints began automatically to drop as we raised the value; and this was the reason for making the statement to which Mr. Shadbolt has referred. In my humble opinion you could increase it to 550 in most cases without causing dissatisfaction. Above 550 I have my doubts, particularly in my own house. Mr. Shadbolt also gave some interesting figures as to the way in which the leakage has been reduced. I do not think I put forward the suggestion that leakage was going to be made worse by low-grade gas. I simply said I would show how it could be made better. Mr. Shadbolt's figures are on a make 50 p.ct. greater; and one would except the leakage to be less with 150 millions than with 100 millions, particularly as probably in the meantime you have stiffened up your distribution department, and paid much greater attention to the consumers generally than you did fourteen years ago. In my opinion this fact alone should tend to reduce the amount of unaccounted-for gas.

The PRESIDENT: I should like to express, on your behalf, our gratification to Mr. Evetts for presenting this paper, on which he must have spent an enormous amount of time. I am certain that the opinion of the members will be that the last paper maintains fully the high level of the communications that have been received at our annual conference this year. I am sorry it was not possible to let the members have advance copies of some of the papers, but the Whitsuntide holiday was a week previous to the meeting, and I can assure you that everything was done to get copies into your hands as quickly as possible. The only thing I am afraid of is that, if we had let the members have the papers a week before, we should have had to have another session to-morrow instead of going to Derby. [Laughter.] I should like you to express your hearty appreciation of the paper, and to thank Mr. Evetts for it.

THE GAS INDUSTRY AND THE GOVERNMENT.

From the Ministry of Transport we have received the following announcement, dated June 9:

The Minister of Transport, who was accompanied by Sir Burton Chadwick, M.P., and Colonel Moore-Brabazon, M.P., received a deputation to-day, introduced by Mr. Milne Watson, representative of practically the whole of the company and municipal gas undertakings.

Mr. Milne Watson and other speakers indicated the uncertainty which prevailed in the industry at the present time, owing to their ignorance of the Government's proposals with regard to electrical development. The views of the gas industry were stated at some length by various speakers; and the Minister was asked to be good enough to indicate as soon as possible any proposals which the Government would consider might affect in any way the gas and the electrical industries.

Colonel Ashley, in reply, stated that it was impossible for him at present to indicate what any Government proposals might be; but he undertook to bear in mind the representations which had been made to him, and to see that due consideration was given to them. He would be glad at any time to receive representations from those interested.

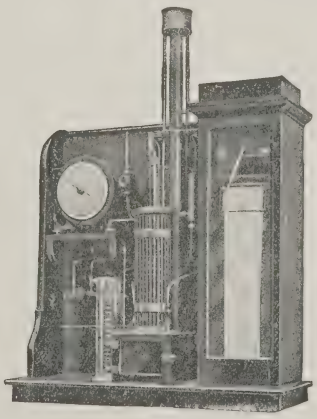
Gas and the Cinema Industry.—In the "Capitol" Cinema—perhaps the most beautiful and most perfectly-equipped cinema theatre in Europe—the air can be heated in the winter and cooled in the summer in order to make the temperature comfortable, and before it enters the theatre it is cleansed of all impurities. Fog cannot enter the building, owing to the air being under a pressure slightly higher than normal atmospheric pressure. The "Plenum" plant, which carries out the double operation of cleaning and heating the air, utilizes a large gas-fired boiler for providing the heat, and thus ensures that neither dirt nor smoke is created in the heating operation. Full particulars of this plant, the boilers of which are situated on the roof of the building, are contained in the current issue (No. 135) of "A Thousand-and-One Uses for Gas."

SIMMANCE'S

PATENT

TOTAL HEAT RECORDING CALORIMETER

The only Recording Calorimeter which combines a Standard Calorimeter and a Recording device.



SOLE LICENSEES,

ALEXANDER WRIGHT & Co., Ltd.,

1, Westminster Palace Gardens, Westminster, S.W. 1.

DERBY GAS LIGHT AND COKE COMPANY.

Description of the Works.

The Derby Gas Light and Coke Company was incorporated by an Act of Parliament obtained in 1820 for lighting the town of Derby with carburetted hydrogen or coal gas. In 1841, a further Act was granted to the Company "for better lighting with gas the borough of Derby and several parishes and places adjacent thereto." By an Act in 1852, further powers were conferred, and by the Midland Railway (Derby Gas) Act, 1867, an exchange of lands between the Midland Railway Company and the Derby Gas Company was authorized, and provided for a site for new works at Litchurch.

In 1876 and 1890, and also in 1903 and 1906, Acts were obtained to enable the Company to raise additional capital and

Fig. 1.—Eighteenth Century Hand-Beaten Wrought-Iron Gates—Cavendish Street Works.

extend further the limits of supply. The 1906 Act authorized the Company to acquire the two undertakings of the Spondon, Ockbrook, and Borrowash, and Mickleover and Etwall Gas Companies. In 1908, the purchase of the Belper Gas Company and Mr. Strutt's Milford Gas-Works was authorized, and the limits of supply were extended to include the districts supplied by these two undertakings.

By the Derby Gas (Charges) Order, 1921, thermal value was substituted for illuminating power, the charge for gas thereby being based on its potential thermal value, instead of its volume. In 1923, a Special Order was made by the Board of Trade under the Gas Regulation Act, 1920, to enable the Company to acquire additional lands at Litchurch and Belper for gas-works purposes.

The Company's area of supply includes the County Borough of Derby (extended from time to time), and also the districts supplied by the five amalgamated neighbouring undertakings. To-day the Derby Gas Light and Coke Company's limits of supply cover an area of some 85 square miles.

The authorized capital is £589,270, with borrowing powers up to £106,017, making a total of £695,287, of which £492,270 of ordinary stock has been issued, and £55,000 of 4 p.ct. perpetual debenture stock. There are in addition £69,635 premiums on stock sold by public auction, upon which no interest is paid. The total expended capital at Dec. 31, 1924, was £646,490.

The make of gas in 1900 was 595 million c.ft., and last year (1924) it was 1661 millions—being an increase of 1066 millions, or 180 p.ct. The mileage of gas mains in the last 24 years has been increased from 90 to 229, and the number of consumers from 18,234 to 38,851.

The Company do a large and increasing business in the sale of fittings, burners, globes, and shades for lighting purposes, and also by letting out, on simple and purchase hire, gas cooking stoves, fires, and all kinds of gas appliances for domestic and industrial purposes. The latest development is to let-out gas engines on simple hire. The price charged for gas used for lighting and domestic purposes compares favourably with that of most other towns, and special advantageous terms are given to industrial and motive power users.

The chief offices and showrooms are centrally situated in Friar Gate; the property on each side having been purchased to enable the Company to extend the main building when required. There is also a branch office and showroom at Belper.

The declared quality of gas supplied is 500 B.Th.U. per c.ft.

Litchurch Gas-Works.

The Litchurch Works are on the outskirts of Derby, on the east side, some two miles from the centre of the town. They adjoin the London Midland and Scottish Railway, and cover about 21 acres; there being a further 57 acres of land acquired by the Company for future developments. These works are divided by the Derby Canal; "A" works were inaugurated in 1867, and occupy about 10 acres; the new "B" works were begun in 1915, to enable the Company to meet the large increase in demand for gas required for war work. Access to "A" or "B" works is by means of a high-level road bridge, railway swing bridge, and two high-level foot bridges over the canal. From the main entrance of the works, a granite-paved roadway, 47 ft. wide, runs almost the whole length of the "A" section works.

At the right-hand side of entrance is an ambulance room. The Resident Manager's house and works offices are on the same side, a short distance inside the entrance gates.

The Works Laboratory is situated almost opposite to the offices, and comprises office and balance room, physical and chemical test rooms, distillation room, stores, and official gas-testing room.

The recording calorimeters and routine testing instruments are fixed in close proximity to the appropriate gas mains, in an annexe to the station meter house, about ten yards from the works laboratory.

The "A" works are divided into two, each section being a complete unit which can be operated separately or jointly by means of by-passes.

No. 1 Retort House is a cellar house 241 ft. long by 52 ft. wide, and contains 18 settings of 8 C-section retorts, 22 in. by 16 in. by 18 ft. long, or 144 through retorts. The settings are heated by 18 Klonnè regenerative furnaces, and the retorts charged and discharged by De Brouwer stoking machines. The charging machine is fed from continuous overhead coal hoppers of 24 hours' storage capacity. The seals on dip pipes are regulared by Dillamore tar columns, and the suction on each retort bench is controlled by retort house governor.

No. 2 Retort House is a stage-floor house, the same size as No. 1 house, and contains 22 settings—11 beds at the west end being 22 in. by 16 in. C-section retorts, and those at the east end 24 in. by 16 in.—all heated by Klönne regenerative fur-

Fig. 3.—No. 2 Retort House, with D.B. Pusher—Litchurch Works.

Fig. 4.—No. 1 Purifier ouse—Litchurch Works.

Fig. 7.—Purifier House for Coal Gas—Litchurch Works.

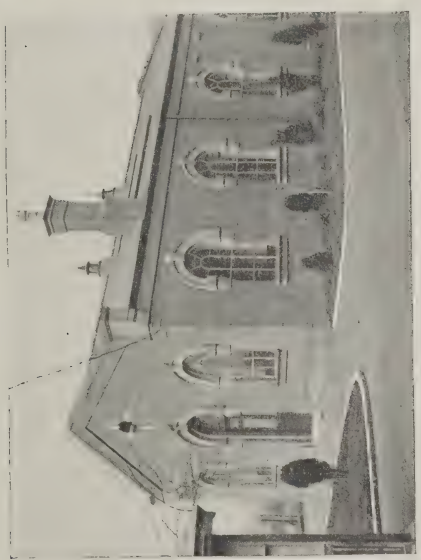


Fig. 2.—Laboratory—Litchurch Works.

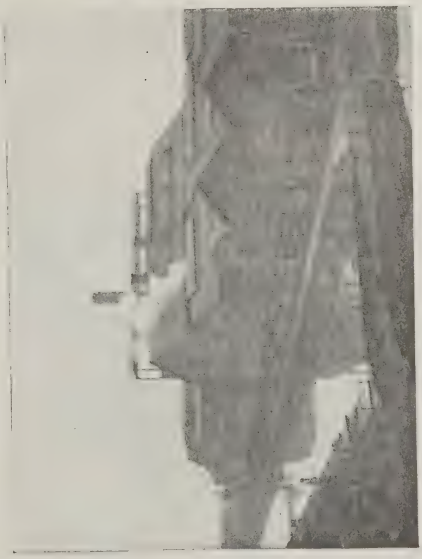


Fig. 5.—"B" Section—Litchurch Works.

naces. The stoking machines are De Brouwer, similar to those in the other house; the coal being fed into the charging machine from overhead continuous coal hoppers.

Each house has a separate wagon tipper, coal breaker, and elevator, constructed to deal with from 40 to 60 tons of coal per hour; the overhead hoppers being fed by longitudinal scraper conveyors. On the opposite side of the houses the hot coke, on being discharged from the retorts, is taken away by De Brouwer longitudinal coke conveyors and cross-inclined elevators, which pass the coke over screens into overhead storage hoppers for loading into railway wagons or carts.

The power for driving the coal and coke handling plants is obtained from gas engines fixed in convenient buildings adjoining the coal breakers, elevators, and conveyors, and varying in size from 25 to 70 H.P. The latter type of engine is in duplicate, and in addition to driving the coal and coke plants for No. 1 house, is belt-coupled to a 45-KW. electric generator, which supplies all the electrical power required for both "A" and "B" works.

Scrubbing and Washing Plant.—No. 1 Section consists of a 2-million c.ft. Livesey tar extractor, a tower scrubber, 12 ft. diameter by 60 ft. high, and a Kirkham rotary washer. No. 2 Section, when completed, will be similar.

Boiler House.—Five Lancashire boilers, each 28 ft. long, three of which are 7 ft. 6 in. in diameter, and two 9 ft. diameter, are fitted with steam superheaters. There are two batteries of economizers for heating the feed water by waste heat. Each boiler is constructed for 160 lbs. w.s.p., and is fitted with a turbine breeze furnace—coke dust or other refuse being used for steam raising.

Pump House.—This adjoins the boiler house and contains, in duplicate, Weir boiler feed pumps, Pearns treble-ram pumps for supplying water from the canal for works purposes, and Lee Howl liquor pumps for supplying ammoniacal liquor to the sulphate of ammonia plant.

Exhauster House.—This contains four sets of gas exhausters (driven by horizontal direct-coupled steam engines) each having a capacity of 120,000 c.ft. per hour. Each set can be coupled to either No. 1 or No. 2 Section.

Purifying House.—No. 1 consists of eight overhead purifiers. Each box is 30 ft. by 25 ft. by 6 ft., and each purifier is fitted with four luteless covers, and Milbourne fasteners and valves. There are four discharging shoots on the bottom of each purifier, the latter being filled by means of an oxide elevator and overhead band conveyor with suitable charging shoots. No. 2 house contains four purifiers, each 30 ft. by 15 ft.

by 4 ft. deep, with water lutes, on ground-floor level, operated by a centre valve. It is intended at some future time to replace these by eight larger purifiers fixed overhead, similar to those in No. 1 house.

Tar and liquor storage is provided under what was formerly a lime shed between No. 1 and No. 2 purifier houses.

Station Meter and Governor House.—This adjoins the purifying houses, and contains two station meters, each of 100,000 c.ft. per hour, with 18-in. to 24-in. connections and by-passes. There are three double-cone water-loaded station governors which control the gas supply on one 30-in. and two 24-in. trunk mains, and there is a smaller station governor for the outlying districts, to which gas is supplied by two high-pressure mains, one 18 in. and one 10 in.

A safety governor is fixed between the inlet and the outlet of the gasholders, so that, if the outlet valves are improperly operated, the gas supply is not entirely shut off.

Naphthalene Washer.—Fixed on inlet main to the gasholders is a 5-million c.ft. per diem rotary washer for extracting the naphthalene from the purified gas prior to its entering the storage holders.

The three gasholders are severally 125 ft. in diameter, 4 lifts; 90 ft. in diameter, 2 lifts; and 140 ft. in diameter, 4 lifts—all in brick tanks. The 125-ft. diameter holder top lift rises above the outside column framing, and is guided by wire ropes. The 140-ft. diameter holder has a flying top lift. These two were formerly two-lift holders, and were converted into four-lift holders to provide additional storage, which now totals 2¾ million c.ft. Including the Railway Company's and two C.W.G. holders, the total storage is 3,900,000 c.ft., which is small for works capable of making 4½ million c.ft. of coal gas and 3½ million c.ft. of C.W.G. per diem. The maximum output of gas from the Litchurch Works is about 5⅓ million c.ft. per diem.

"B" Works.

These works were begun in 1915, to enable the Company to meet the large increase in the demand for gas during the war. It was imperative that additional gas-making plant should be erected and put into operation as quickly as possible. Hence C.W.G. plant was decided upon.

The Generator House, with boiler, engine, and meter houses, form one block of buildings facing the canal on the main roadway, 43 ft. wide, which runs the whole length of these works. This section is designed for an ultimate output of 10 million c.ft. of C.W.G. per diem. The plant at present installed comprises one 2-million c.ft. and one 1½ million c.ft. Humphreys and Glasgow C.W.G. sets. Attached, and serving either plant, is a vertical tubular waste-heat boiler, capable of producing all the steam required by one set. There is sufficient room in the generator house to erect three more C.W.G. sets. In the same building are two Lancashire boilers, each 30 ft. long by 9 ft. in diameter, fitted with superheaters and turbine breeze furnaces, and with a Green economizer at the back, for heating the feed water. There is sufficient room for three more boilers.

Fig. 6.—Operating Stage, C.W.G. Plant, showing Waste-Heat Boiler—Litchurch Works.

The water for steam-raising is softened by a Lassen Hjort plant.

The Blower House contains two Sturtevant fans, each driven by a 55-H.P. Greenwood & Batley turbine; and there is also a 120-H.P. Hodges steam turbo-blower capable of delivering 15,000 c.ft. of air per minute against 30-in. water-gauge pressure.

The Engine House contains two Bryan Donkin exhausters, each of 150,000 c.ft. per hour capacity, coupled direct to vertical high-speed enclosed steam engines, for pumping the gas from the storage holders and delivering it through a 24-in. main to "A" works, where it is mixed with the coal gas on the inlet main to the gasholders. The gas sent over is measured by a 150,000 c.ft. per hour station meter.

Weir service and boiler feed pumps in duplicate supply all water required on the "B" section.

The coke required for the production of C.W.G. or blue gas is carried by the Company's own railway wagons and shunting locomotives to a wagon tipper, is elevated, and stored in overhead coke storage hoppers, and discharged by shoots over screens into the generator by the hydraulic charging ram, thereby maintaining a constant depth of fuel in the generator. A hydraulic lift and bogies are provided as a duplicate coke-handling plant.

C.W.G. Purifiers.—The water gas is purified in four boxes on ground-floor level, each 40 ft. by 30 ft. by 6 ft. deep, with four luteless covers for emptying and filling. These purifiers are in a covered shed 141 ft. long by 49 ft. wide, with revivifying sheds on each side, 37 ft. wide, for the full length of the building. The gas through the four boxes is controlled by Milbourne inlet and outlet valves and connections, all of which are readily accessible. For filling and emptying, small electric travelling cranes, with tip buckets, run the length of the house alongside the boxes.

C.W.G. Holders.—Storage accommodation is provided by two gasholders in steel tanks. The ¼-million c.ft. holder is spiral-guided, and the ½-million c.ft. is a three-lift one, with outside guide framing.

"A" and "B" are works connected by a works telephone system to the various sections, whereby hourly records are obtained of the different operations.

Chemical Plant.—The sulphate of ammonia plant is contained in a building about 120 ft. long by 62 ft. wide, one-half of which is reserved for storage of sulphate. This plant was recently supplied and erected by the Chemical Engineering Company. It contains several new features, and is capable of producing 6 tons of dry neutral granular salt per day. It consists of a combined fixed and free ammonia still, with liming chamber and closed type of saturator fitted with a Wilton discharger. A small coil condenser provides the liquor for spraying and neutralizing the salt, which is carried on a steel belt conveyor over vacuum pipes, and then discharged into a horizontal belt-driven dryer fitted with steam pipes. After drying, it is delivered into bags attached to an automatic weighing machine.

Sufficient room has been allowed for the erection of two additional similar units. It is intended to remove the concentrating ammonia liquor plant from the old sulphate buildings, and to re-fix it in the new house.

The effluent gases from the still are cooled by tubular condensers, and finally by 800 ft. run of 8 in. diameter water-cooled cast-iron pipes. They are afterwards treated by open oxide purifiers.

The Tar Dehydrating Plant is a Wilton coil dehydrating plant, to which has been added extra coils to enable No. 1 Road Board Specification tar to be made. This will deal with about 20 tons of crude tar per 24 hours. Direct-fired stills are now in course of erection to produce No. 2 Road Board tar for road purposes.

Cyanide Plant.—The whole or any portion of the coal gas made may be freed from hydrocyanic acid content by being passed through a Pelouze tar extractor and a Holmes cyanide washer. The washing medium is prepared by precipitation of iron from copperas by means of a light alkali. From the circulating liquor, prussiate of soda is recovered in the form of yellow crystals by the Davies-Neil process.

"B" Works New Coal Gas Plant.

A start has been made by the erection of a large steel-framed building, containing four overhead purifiers, each 45 ft. by 40 ft. by 6 ft. deep; each box being fitted with four luteless lids secured by Milbourne's fastenings and with discharge shoots on the bottom. A new feature is that the inlet and outlet pipes for controlling the gas are overhead, and thus readily accessible. The oxide is elevated by a bucket elevator, which feeds on to a rubber band conveyor running the whole length in the centre of the house; and a travelling discharger with shoots enables the oxide to be filled into the purifiers with a minimum of labour. The oxide handling plant was recently supplied and erected by the Ewart Chain Belt Co., Ltd., of Derby. The ground floor under the purifiers and adjoining the revivifying shed is used for the preparation and storage of oxide.

Fig. 8. Entrance—Cavendish Street Works.

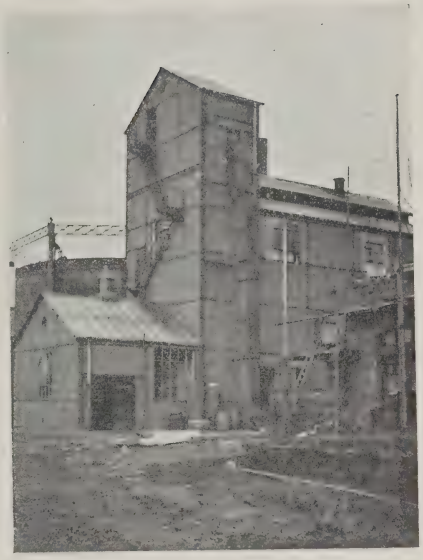


Fig. 9.—Tully Plant—Belper Works.

Station Meter House.—The meter house adjoins the purifier house and contains a 200,000 c.ft. per hour Parkinson station meter with the necessary 24 in. diameter valves and connections. The purifying plant is so designed that it can easily be doubled at any future time.

It is intended that the new "B" section coal-gas plant will be in 5 million c.ft. per 24-hours units, each section to be worked separately, similar to the "A" section.

Ample space is allowed for railway sidings in all directions, for future extensions, and especially for storage of coal, coke, and other residual products.

Cavendish Street Works.

This is the Company's original manufacturing station. It was erected in 1820, and has been entirely re-built and extended from time to time, and now covers an area of some four acres. These works are situated directly at the back of the chief offices in Friar Gate. It may be recalled that the first D.B. stoking machine was installed at the Cavendish Street Works and aroused much interest at the time. The carbonizing plant consists of both horizontal and vertical retort settings. There are six through horizontal beds of 8 ⏀ shape, 21 in. by 15 in. by 18 ft. retorts, operated by the D.B. latest type of combined machine. This is fitted with the latest pattern discharging ram; the old telescopic lengths, together with their catches and stops, being dispensed with. The Oxford safety device for holding-up the body of the machine in case of the hoisting chains failing is also fitted, together with electric cut-outs to prevent overwinding, &c. Extension of the power plant in connection with this machinery and the vertical installation is now under consideration.

The Vertical Retort House.—The bench, till it was recently demolished, comprised six beds of Wilson-Glasgow continuous intermittent vertical retorts—36 in all—having a nominal capacity of 1,000,000 c.ft. per diem. Coal is delivered through a single roll crusher, or direct to a gravity-bucket elevator conveyor which feeds overhead hoppers of 48 hours' capacity. The new bench is at present being erected by West's Gas Improvement Company, and will consist of five beds of their latest design. There will be eight 20-ft. retorts per bed, or 40 retorts, having a productive capacity of 1,400,000 c.ft. per diem. The existing steel stancheons, overhead bunkers, coal breaker, and G.B. elevator and conveyor, and the foul gas main, will all be incorporated in the new installation. A Kirke waste-heat boiler will be erected on the site of one of the old vertical retort beds, and it is expected that this boiler will give an evaporation of 3000 to 4000 lbs. of water per hour. The entire work will, it is anticipated, be completed in time for next winter's demand.

The exhauster engines at this station are of the vertical enclosed type, by Messrs. Robey & Co.; and the exhausters, by the Bryan Donkin Company, Ltd., have a capacity of 2 million c.ft. per diem.

The washing plant comprises a Livesey washer, a tower-scrubber, and a Holmes rotary washer. There are two sets of purifiers. No. 1 house contains four boxes, each 20 ft. by 14 ft. by 3 ft. 6 in., operated by double-faced Cockey centre valve, so that the boxes may be worked either three or four at a time. No. 2 house contains four boxes, 30 ft. by 15 ft. by 4 ft., operated by a Weck centre valve.

The gasholders, three in number, have a capacity of 500,000 c.ft. The governor house contains the station meter and station governor, a separate governor for the outlying districts, and a safety governor to correct improper gasholder valve operation. The exhauster house contains two sets of gas compressors, by the Bryan Donkin Company, Ltd., which may be used either for high-pressure distribution in the town or for pumping gas at 2 lbs. per sq in. pressure to Belper (8 miles), and feeding various villages through district governors *en route*.

The mechanics and blacksmiths shops have recently been enlarged; and at these works are garages for the steam wagons, lorries, motor vans, and cars required in connection with transport over the Company's extensive area of supply. The works office and chief stores, situated at the entrance to the Cavendish Street Works, have recently been extended, to allow more room for the numerous stores now required in connection with the distribution department.

An official testing station for these works and the works' laboratory have recently been erected, and are controlled from the Company's well-equipped main laboratory at Friar Gate.

The laboratory comprises the top floor of the general offices, and includes an office, photometer room, dark room, laboratory, balance and physical test room, store room, &c.

Belper Gas-Works.

The Belper Works of the Company, eight miles from Derby, are situated on the banks of the Derwent, and were purchased from the old Belper Gas Company about eighteen years ago. They are now connected by a high-pressure main to the Cavendish Street Works. A considerable part of the total area of 6½ acres is available for extensions; the present output being just over 100 million c.ft. per annum.

A railway siding adjoins the retort house, thus facilitating handling of coal and dispatch of tar and liquor. The carbonizing unit consists of 6 beds of 8 stop-ended ⏀-shaped retorts (operated by hand and heated by regenerative furnaces), and a Tully gas plant of 500,000 c.ft. capacity per diem, erected in a steel-framed building. This plant is utilized as far as possible to supplement the output from these works. It is fitted with a superheater, and by the addition of oil can produce high-quality gas, should this be required at rush periods. Temperatures are controlled by electrical pyrometers. This auxiliary plant has been very useful, and, considering its necessarily spasmodic operation, the results obtained are quite good.

Two additional Lancashire boilers, 28 ft. by 7 ft. 6 in., with superheaters in each case, have recently been installed. These boilers are suited for a w.s.p. of 200 lbs. per sq. in., and are fitted with turbine breeze furnaces.

Scrubbing and Washing Plant.—This comprises a P. & A. tar extractor, a Livesey washer, a Kirkham washer, and a Walker scrubber. The purifiers, 25 ft. by 20 ft. by 5 ft., are dry sealed, and are operated by Milbourne patent valves. The new section of the works is laid out for a daily output of 1,000,000 c.ft.

The gasholder, of 500,000 c.ft. capacity, is spirally guided; and there is a small relief holder (for Tully gas) connected to the hydraulic main in the retort house. The supply to the Belper district is governed by a 15-in. Parkinson double-coned station governor; and a second outlet from the holder feeds gas to the high-pressure main running back to Derby.

Fig. 10.—Entrance to Showroom, Friar Gate.

The works are equipped with mess room, office, and laboratory containing the official testing apparatus.

Distribution Department.

The showrooms are on the right-hand side of the main entrance to general offices, with a reception room (oak panelled), and a showroom divided into a number of recesses to exhibit various patterns of modern gas fires and fittings for lighting. The rear portion of the showroom is partitioned off by oak panelling, and contains a number of gas cooking stoves, and water-heating appliances. There are a porcelain bath, sink, &c., to enable various apparatus to be demonstrated in actual operation. An adjoining room is fitted with show-cases to display lighting fittings, burners, glassware, silk shades, &c.

The distribution office and shops comprise accommodation for the Superintendent, office staff, inspectors, and foremen; and there are also repair shops for dealing with meters, fittings, stoves, &c.

For many years the Company have supplied, and fixed complete, gas engines on hire-purchase; and recently it was decided to extend ordinary hire facilities to gas engines. The Company inspect, test, and maintain gas engines at a nominal charge; the result being that those who use gas for power purposes can rely upon a continuous power supply at the low figure of about ½d. per B.H.P. hour.

The Company employ a specially trained staff of fitters for piping houses, and fixing lighting installations, gas cooking stoves, fires, geysers, water-heaters, and all kinds of gas appliances for domestic and trade purposes.

Inspectors and canvassers keep the Company in close touch with consumers, and advise and estimate for their wants and requirements in all matters pertaining to the use of gas for lighting, heating, and power.

AT THE FULHAM GAS-WORKS.

The members who had elected to take part in the visit on Thursday afternoon to the Fulham Works of the Gas Light and Coke Company numbered 200 and more, and included the President (Mr. Ferguson Bell). They assembled at the Chief Offices of the Company in Horseferry Road, where Mr. Thomas Hardie (the Chief Engineer) awaited them, and punctually at the appointed time set out in motor coaches for the works. To the great disappointment of both the Governor (Mr. D. Milne Watson) and Mr. Hardie—and also, it need hardly be added, of the visitors—neither of them was able to accompany the party; it being explained that they had to remain in town to attend a meeting there in connection with the gas industry.

On arriving at the Imperial Wharfe entrance to the works, the members were received by Mr. A. H. Solomon, who offered them a cordial welcome, and in every way proved an admirable host. It was noted at once—from the very moment of forming the parties for inspection—that the most complete arrangements had been made by the Company for the comfort of their guests, whose path from start to finish proved a smooth—if somewhat hot—one. Many points about the Fulham Gas-Works struck the members of the Institution favourably, and not least among these must be placed the efficient organization which was revealed in the planning and carrying out of the programme. Mr. Solomon was everywhere, and all the officers detailed to assist were everywhere; no one had need to go without any information he might desire; and yet there was no crowding at all. Mr. Samuel Glover, with long and varied experience of visits to works, was warm in his praise of the excellence of the organization and of the services of the guides; and the reception which his remarks met with showed how thoroughly his hearers were in accord.

So much having been said, it would be unfair to leave the story incomplete; so we will add that the visitors were divided into six parties, all neatly badged, and were placed under the leadership of (1) Mr. Grogono, (2) Mr. Calvert, (3) Mr. Davies, (4) Mr. Tanner, (5) Mr. Parkinson, and (6) Messrs. Ball and Holdway. To these parties were attached the following members of the engineering staff: (1) Messrs. Hunter, Richmond, and Barclay, (2) Messrs. Mitchell, Anderson, and Royle, (3) Messrs. Wood, Wallington, and Tutton (Construction Department), (4) Messrs. Stewart, Culbertson, and Lacey, (5) Messrs. Hutchence and Cooper (Construction Department), (6) Messrs. Sheridan and Phillips (Construction Department). In their tour the visitors were further aided by an illustrated brochure, the description contained in which is given below.

From this description, some idea will be gathered of how much there was to be seen. It is always a treat to be privileged to inspect constructional operations on a gas-works; and the treat was offered here in no unstinted measure. First of all (taken in the order of inspection) there was the strengthening of over 290 ft. of river wall; and the crane track, upon which two electric cranes, of 125 tons per hour each, will operate. A reinforced concrete hopper to store 2000 tons of coal is being constructed; and under this has been completed the conveyor pit, in which will work an endless and reversible (for the purpose of loading barges at either end in the future) belt conveyor, 250 tons per hour, at 260 ft. per minute, delivering at the east end on one of a series of belts conveying the coal into retort houses some 600 yards distant or to the storage ground of 40,000 tons. The coal will be reclaimed from store by means of an 8-ton electrically-driven crane. Large reinforced concrete purifiers are also being constructed. All the complete new plant referred to in the description to which the attention of readers has already been directed has had to be erected on the very limited ground area which was at disposal after pulling-down existing small plant, and the usual manufacture at the station has had to be carried on during the reconstruction, alterations to mains, &c.

As much time as was available was naturally devoted to the carbonizing plant; the reconstruction of No. 1 retort house having been in hand during the past eighteen months. There are sixteen settings of eight Glover-West vertical retorts, built to produce 7 million c.ft. of gas in 24 hours, carbonizing 450 tons, at 70 therms per ton. The retorts are of the Leigh type; and the settings are fully equipped with waste-heat boilers. In the retort house a full set of drawings of the installation were displayed. These drawings included arrangement drawings of the installation as a whole, together with a set of detail drawings of the retort settings and of the working parts of the plant. These detail drawings will be handed over to the engineers in charge of the operation of the retort house. They are fully marked with reference numbers, by which every moving and renewable part can be identified—thus greatly facilitating repairs and renewals when such become necessary. It may be mentioned that coal is weighed automatically when entering the retort house, while on the belt conveyor; while coke is also weighed automatically before being charged into the producers.

On reaching the new stove shops, most welcome and most bounteous hospitality awaited the visitors—most of whom by that time showed evident signs of having borne the "heat and burden" of the day. Mr. Solomon then explained the cause of the regretted absence of the Governor and the Chief Engineer. He remarked that the Institution, already a great body, promised in the future to be of still greater importance. They as members should honour those gentlemen who, within recent years, had brought the Institution to the position which it now occupied. So far as the Fulham Station was concerned, it had been a great anxiety to them to get the place into a fit state for the visit. Fulham had always enjoyed the reputation of being neat and tidy; but this was doubly hard to maintain with

VIEW OF THE STATION FROM THE AIR.

so much reconstruction work on hand. He hoped that what they had seen had proved of interest to them. Mr. Samuel Glover, in terms which met with the approbation of all present, voiced their thanks to the Governor and Directors of the Gas Light and Coke Company for their invitation to visit the works, and for the hospitality that had been extended to them. He also made graceful and well-deserved acknowledgment of the attentions of Mr. Solomon and the services of the guides. Notwithstanding what had been said by Mr. Solomon as to the conditions of the works, he could assure him of the great joy experienced by gas engineers in visiting a works under reconstruction. Mr. Hubert Pooley seconded the vote of thanks, of which Mr. Solomon made suitable acknowledgment.

DESCRIPTION OF THE WORKS.

This station was one of the original works of the Imperial Gas Company, which amalgamated with the Gas Light and Coke Company in 1876. At that time the Engineer of the works was Mr. E. Kirkham, who was the designer of the station as it then existed.

Site.—The site covers an area of 29½ acres, and in part adjoins the North Bank of the Thames a short distance above Chelsea Railway Bridge. A creek from the river, terminating in a dock, enables coal barges—loaded at the Company's Beckton Works—to be unloaded by three wharf-side cranes. The works is also connected by direct siding with the West London Extension Railway; and coal, bricks, and other goods can be received by this means.

The tar, liquor, and oxide of iron are all sent away, for working up, by barge to the Company's Chemical Works at Beckton.

Capacity.—The works has a present daily winter output of 10½ million c.ft., but the extensive reconstructions now nearing completion will raise this to over 17 million c.ft. daily. At the same time improved means of coal reception, so as to unload direct from the Company's own colliers, are being installed upon the river front.

Existing Plant.

Coal Gas Plant.—No. 3 retort house contains 200 retorts, 23 in. by 16 in. by 20 ft. long, in 20 beds operated by a Fiddes Aldridge machine. The house carbonizes 230 tons daily, and produces therefrom 3 million c.ft. of gas.

No. 4 retort house contains 144 inclined retorts in 18 beds. It is not much worked at present, but will make 2 million c.ft. daily.

No. 5 retort house is similar in type to No. 3, but the retorts

CARBURETTED WATER GAS AND VERTICAL RETORT HOUSES

are 22 ft. long. The Fiddes Aldridge machine is of the latest type. The house carbonizes 250 tons of coal, and produces 3,250,000 c.ft. of gas daily.

In all three houses, coke handling is by drag-bar conveyors into outside loading hoppers.

Water Gas Plant.—This plant, together with the attendant boilers, blowers, and other machinery, is housed in one row of buildings adjacent to No. 1 retort house. It consists of two twin-generator Humphreys & Glasgow carburetted water gas units, each of 1½ million c.ft. daily capacity, and one Humphreys & Glasgow 1½ million c.ft. daily capacity blue water gas unit. All three sets are equipped with waste-heat boilers, stage clinkering floor, and, subsequent to the present reconstruction, will have mechanical coke handling plant.

Exhausters.—These are housed in one building. There are eight sets, seven of which are by Messrs. Gwynne & Co., and one by Messrs. Waller & Co. The house also contains a Reavell positive booster driven at 800 r.p.m. by a 90-H.P. motor.

Ammonia Plant.—At the rear of the exhauster house is the ammonia purifying plant. The gas is exhausted before passing through the condensers. There are two sets of atmospheric, and two sets of water-tube (Clapham), condensers. These are followed by three sets of washing plant, each consisting of one Livesey washer and one rotary washer-scrubber. From this point the gas passes across the works by two 24-in. mains to tower scrubbers, where the last traces of ammonia are arrested.

Purifiers.—There are four sections of purifiers. The two of more recent construction, allocated to coal gas, are luteless boxes arranged overhead, and each section consists of five boxes. Each box measures 48 ft. by 30 ft. by 6 ft. 6 in. deep, and has a capacity of 130 tons of oxide when laid in two tiers on wooden grids.

The two remaining sections for water gas are of old design, and have counterbalanced water-luted lids. Each section is worked in two streams of three boxes. Each box measures 37 ft. by 20 ft., and holds 70 tons of oxide. The coal gas, before entering the station meters, is washed with gas oil, for the removal of naphthalene.

Station Meters.—There are three meters, two of 250,000 c.ft. per hour for coal gas placed partly below ground, and one of 150,000 c.ft. per hour for water gas. All are in the open.

Holders.—There are five holders of a total capacity of 8½ millions. One 2 million c.ft. holder has been removed recently for reconstruction. All have brick and puddle tanks.

Electric Generating Plant.—All the current at present required on the works is generated in the room adjoining No. 3 retort house by means of two 150-KW. vertical gas engine driven sets, producing 220 v. direct current. Three smaller units have been removed recently to make room for more modern and enlarged plant, described later.

Steam Plant.—Apart from the water gas plant, all steam required is produced at 120 lbs. per sq. in. pressure in a range of six hand-fired Lancashire boilers of the Thompson dish-ended type, 30 ft. long by 8 ft. 6 in. diameter. The furnaces are all of forced-draught breeze-burning type, and the fuel is to a large extent mechanically handled.

Coal Handling Plant.—At the present time coal is brought in barges into dock, and unloaded by grabs. It is then conveyed by belts to a central crushing plant, and distributed therefrom to the several retort houses by belt conveyors, and thence to the bunkers by house conveyors which are of the push-plate type in Nos. 3 and 4 houses, and the shuttle rubber belt in No. 5 house. The whole belt conveying handling scheme has been installed recently.

The store of over 20,000 tons of coal in the yard was formed by means of small trucks fed by a push-plate conveyor which has now been displaced.

Water Supply.—The deep well, constructed in 1907, is a 12 in. borehole, 501 ft. deep. Water is raised by a 75 H.P. gas engine driven Reavell air compressor, or alternately by an Alley and Machellan compressor direct coupled to a 65 H.P. motor. The plant is capable of dealing with 8000 gallons per hour.

Reconstruction Work.

This work embraces the erection of a complete plant throughout for the production of 7 million c.ft., or 35,550 therms, per day.

No. 1 Retort House.—The reconstruction of this house has been in hand during the past 18 months. There are 16 settings of eight Glover-West vertical retorts (33 in. by 10 in. by 25 ft.), built to produce 7 million c.ft. in 24 hours, carbonizing 450 tons at 79 therms per ton. The retorts are of the Leigh type, and the settings are fully equipped with waste-heat boilers.

Condensers.—A battery of atmospheric condensers, erected by the Company, consisting of 12-in. zigzag pipes, is supplemented by two water-tube condensers erected by Messrs. W. C. Holmes & Co., of Huddersfield.

Exhauster House.—Nearby, a smaller building originally used as a lobby and store has been enlarged, to house three Donkin exhausters, each of 175,000 c.ft. capacity per hour. The building also houses a small Waller air exhauster for the purifiers, and sundry pumps for tar and liquor.

Washers.—For tar removal there are two Livesey washers, each able to deal with 3½ millions per day, supplied by Messrs. Cockey & Sons. For ammonia extraction there are two rotary washers, each of 7 million c.ft. per day capacity, built by the Wheesoe Foundry Company.

Purifiers.—Reinforced concrete purifiers are being constructed nearby. The boxes are elevated above ground. There will be two sections of four vessels, each vessel measuring 50 ft. by 35 ft. by 6 ft. 6 in. Above, there will be a revivifying floor, to which the oxide will be raised by an elevator, and distributed, after passing through a disintegrator, by a belt conveyor. The ferro-concrete is being constructed by Concrete Piling, Ltd., the oxide handling plant by Messrs. R. Dempster & Sons, and the steel covers by Messrs. E. Cockey. The cast-iron mains and connections, supplied by the Stanton Ironworks Company, will be fixed by the Company. These and the mains in the exhauster house are the only ones under the ground. The remainder, of steel, will be run upon supports overground.

Meters.—There are two meters, each of 250,000 c.ft. per hour capacity, by Messrs. Parkinson & Co., erected in an old gasholder tank. An additional 36-in. main from meters to gasholders has been installed to handle the gas from this new plant.

No. 4 Gasholder.—The demolition of this is just completed. It was built in 1856, and was in excellent preservation, but was removed in order to obtain further storage capacity. Messrs. R. & J. Dempster, Ltd., are the Contractors for the erection of a four-lift spiral-guided holder of 4 million c.ft. capacity, which is double that of the former holder in the tank.

Water Tower.—Owing to the building of the new purifiers upon the site which included the water supply tank to the works, it has been necessary to provide a new tank. This has been constructed in reinforced concrete, to the Company's design, by Concrete Piling, Ltd., upon a site by the railway siding. Its capacity is 60,000 gallons, and it is 77 ft. high.

Coal Plant.—At the river front the quay wall is being strengthened by the driving of 35 ft. concrete piles (Contractors, Messrs. Saxild & Partners) for the purpose of supporting two electric cranes (capacity, 7½ tons maximum load) and to enable a berth to be provided for the ships. The coal will be unloaded into a reinforced-concrete bunker (capacity, 2000 tons), from which it will be conveyed by belts to a crushing station, and thence to the retort houses—a total distance of 600 yards—or to the storage ground, at the rate of 250 tons per hour. Coal is reclaimed from the stock heap by an 8-ton travelling crane with a 60 ft. luffing jib at 150 tons per hour, and delivered to the belt conveyor system. The conveying plant and stocking plant are being erected by the Mitchell Conveyor Company.

Electric Generating Plant.—To provide further power, and at the same time effectively to utilize the steam from the waste-heat boilers, in the power house there is in the course of erection one 500 KW. D.C. 220-240 v. turbo-generator and condenser, and one 250 KW. A.C. 500 v. 3-phase 50-period turbo-generator and condenser, together with an air pump for each set, and circulating pumps in duplicate, switchgear, &c. In addition a motor generator has been installed as a connecting link between the A.C. and D.C. supply. The alternating current is arranged for the long-distance coal plant supply, and the direct current for the more local supplies. The Contractors for this plant are the Lancashire Dynamo Company, Ltd., who are supplying turbines built by Messrs. C. A. Parsons, Ltd.

VISIT TO THE NATIONAL PHYSICAL LABORATORY.

The party visiting, by permission of Sir Joseph Petaval, K.B.E. (Director), the National Physical Laboratory, consisted of about one hundred, and were in charge of the Secretary of the Institution.

They were received, on behalf of the Director, by Mr. G. R. Edwards, Assistant Secretary. The arrangements made for conducting the members and their ladies (of whom there was a good number) were perfect.

Perhaps the feature which proved of the greatest interest was the William Froude National Tank. In 1908, by a gift of £20,000 from Sir Alfred Yarrow, Bart., the well-known torpedo-boat builder of the Clyde, the construction of the tank was commenced. Completed in 1911, it consists of a concrete tank 550 ft. long, 30 ft. wide, with a depth of water of 12½ ft. in the centre. Experiments on models of ships are carried out with the object of improvement in ship design and propulsion. The models are made of paraffin wax in a special cutting machine with flying cutters which reproduces exactly the lines of the ship as designed by the naval architect. By means of a spoke-shave, the model is finished-off carefully by hand. It is placed on the bed of the machine with the keel uppermost. The apparatus for determining the water resistance to the motion of the model, and for making other required measurements, is installed on an electrically-propelled carriage which spans the tank and runs on rails laid on either side. The equipment includes apparatus for producing waves so that tests of models in rough water can be carried out. A false bottom enables the effect of shallow water on resistance, steering, &c., to be studied. Tests on propellers and on models fitted with propellers, form part of the routine work. The drawings of a ship received on (say) Monday morning can be worked upon, the model

produced and tested, and a report of its performance sent to the client, if needs be, on the Saturday following. A test costs £140 to carry out; but it is quite possible that the reduction of horse-power resulting from the disclosure of the tests may save that amount in the cost of fuel in one voyage of the ship itself.

The experiments are supplemented by full-scale observations on the ships themselves. The Suez Canal has been visited to study the effect of shallow water on the steering of actual ships, and voyages have been made in rough weather to obtain data relating to the motion of ships in waves, for comparison with the conclusions derived from the researches conducted in the tank.

Another department which attracted considerable interest was the Sir Julius Wernher Metallurgy Building, the gift of Sir Julius in 1911, to advance the science of metallurgy. The workers here deal with the physical and mechanical properties of metals and alloys, in which the proportions of the different constituent metals are varied over a wide range. Aluminium-copper, aluminium-copper-nickel, aluminium-copper-manganese-silicon, &c., have been examined, as also the effect in the production of such alloys for practical use, of different heat and mechanical treatment, and the various processes which must be employed in the application of the materials to constructional purposes. Microscopic and X-ray examinations of and structure of the metal or alloy to mechanical, thermal, and electrical tests of the resulting products are carried out.

The physics, electricity, metrology, and engineering departments were also seen, and in the aerodynamics department was shown the method of testing aeroplanes, propellers, &c. It was formed in 1909 at the invitation of the Government.

Tea was served at the conclusion of the visit in the spacious canteen. There were flowers, grown on the premises, for the ladies. A vote of thanks was proposed by Mr. C. Dru Drury, member of Council.

THE INSTITUTION AT OLD KENT ROAD.

Visit to the Chemical and Physical Department of the South Metropolitan Gas Company.

PERHAPS the best indication of the remarkable interest of the visit of a section of the Institution of Gas Engineers to the Chemical, Physical, and Industrial Laboratories of the South Metropolitan Gas Company at Old Kent Road was that, almost before one had realized the fact, the visit was concluded, and one was returning to Westminster. And yet the tour of inspection had lasted two-and-a-half hours—and this on an afternoon when the thermometer registered 87 degrees in the shade!

Motor coaches conveyed the party, which numbered about a hundred, from the Institution of Civil Engineers to the Old Kent Road Station of the Company. The weather was delightful, and even Old Kent Road was robbed of its customary drabness. On arrival at the works, the visitors were divided into small parties, and without delay commenced an inspection which proved to be, as Mr. C. F. Botley, the new President of the Institution, so aptly described it, a "real intellectual treat."

THE CHEMICAL SECTION.

This was visited first. On entering the laboratories, one is immediately impressed—and the impression is enhanced by closer inspection—with the general note of cleanliness. There is that atmosphere of orderliness which makes for proficiency.

Attention was first of all drawn to an apparatus for carrying-out trial-carbonizations for determining the effect of temperature, rate of heating, physical and chemical nature of coal, &c., upon the yield and nature of products obtained. Specimens of coke and tar obtained in this apparatus showed the effect of different rates of carbonization; and other specimens of coke demonstrated the effect of blending different materials with the coal for the purpose of avoiding expansion. Specimens of briquettes of 70/30 coal-coke mixtures, carbonized at high and low temperatures, and exhibits showing the effect of the size of particle upon the nature of coke obtained from coal-coke mixtures next claimed attention. The visitors passed on to examine an apparatus used for comparison of the activity of various catalysts in connection with the removal of carbon bisulphide from gas. It was explained that the best results are obtained from a nickel-thoria catalyst; the velocity of the reaction with this compound being two or three times as great as with the original nickelized fireclay. There was also a model of a sulphur extraction plant for testing-out modifications suggested from the results of investigations on the small scale in the laboratory. It is not possible here to detail all the interesting exhibits, which evoked the praise of the visitors from two points of view—the intrinsic value of the exhibits themselves, and the excellent way in which they were set out.

On the subject of the removal of hydrogen sulphide from gas, there was a demonstration of the methylene blue test for the quantitative determination of minute traces of hydrogen sulphide. This colorimetric test is based on the interaction of hydrogen sulphide with dimethyl-*p*-phenylenediamine and ferric chloride in acid solution, to give methylene blue. The hydrogen sulphide is primarily absorbed in ammoniacal cadmium chloride solution and liberated for the reaction by the addition of acid. Nearby was an apparatus for introducing measured traces of hydrogen sulphide into coal gas, and demonstration thereby of the sensitivity of the Referees' testing apparatus. There were exhibits demonstrating the causes of the occasional contamination of completely purified gas by hydrogen sulphide upon storage in gasholders; and the bacterial origin of the hydrogen sulphide, and its suppression by the use of sterilants.

TAR FOR ROAD SURFACING.

One of the most interesting features in the Chemical Section was a well-planned and convincing demonstration that tar suitably treated could be applied to roads without endangering fish life—a subject which of late has received much publicity.

Explanation was given of the systematic tests of tar for fluidity or viscosity, volatilization, binding power, and resistance to compression and recompression; and there was a demonstration of a disinfectant fluid prepared by an emulsifying agent, which, unlike soap, gives a product unaffected by hard water.

The visitors passed on to examine an apparatus for determining volatile matter in coal under conditions more precise than those laid down in the so-called "American Test." Another highly interesting item was an apparatus for determining the ignition point of coke.

A demonstration of corrosion specially dealt with the corrosion of gasholders in which metallic surfaces are brought into contact with water. The galvanic nature of such corrosion was demonstrated, together with the possibilities and limitations of methods of preventing it.

INDUSTRIAL SECTION.

General admiration was expressed of the Industrial Demonstration Laboratory. This constitutes a general exhibit of industrial appliances, furnaces, &c., which have either been designed and erected to meet the special requirements of consumers, or have recently been submitted for examination. In this exhibit are included muffle and crucible furnaces, fish-frying ranges, apparatus for the manufacture of confectionery, and various types of industrial burners. The value of such laboratories is becoming more and more appreciated; and several of the larger undertakings in industrial centres have come to regard them not merely as desirable, but as essential.

In the Burner Workshop the visitors were able to see the production of ejector discs. Orifices of standard dimensions are produced in discs of nickel alloy, which are simultaneously cut from the sheet metal by specially designed machines. In order to produce smooth passages for the efflux of gas, the discs are burnished by hand. They are then mounted in seatings cut in the disc-holder, and are spun, so as to ensure that no leak can occur between holder and ejector disc. The orifices are tested to ensure that the jet of issuing gas will be directed axially down the burner tube. For this purpose a jet of gas issuing from the ejector orifice is ignited, and the ejector rotated about its axis. Any departure of the stream of gas from an axial direction is clearly seen. A system of limit gauging for the standardization of all component parts was demonstrated. These standardized parts are assembled into a burner which is examined for symmetry, alignment, &c. The assembled burners are placed on a bar supplied with gas at a pressure of 25 tenths water-column, and each burner is lit for a period of half-an-hour, and the character of the flame in each burner visually examined. Burners exhibiting defective flames are rejected. The consumption of each burner is determined in order to ascertain that it falls between specified limits. A similar procedure of standardization and examination is applied to the production and assembling of gas fires, and street lighting, high-pressure, and cluster burners.

PHYSICAL SECTION.

Arrived at this Section, inspection was first made of the photometer room. This is equipped with a photometer bench enabling the radial distribution of illumination from sources of high or low candle power to be carried out expeditiously. A complete survey of any source occupies about half-an-hour. An incandescent mantle, standardized against the Harcourt pentane 10 c.p. lamp is employed as a secondary standard. The bench was shown equipped for the measurement of the radial distribution of illumination from a street lamp in which reflection is utilized to effect concentration of considerable illumination in directions approaching the horizontal.

Illumination by a "Daylight" mantle was compared with that given by an ordinary mantle; and the determination of the intensity of various parts of the spectrum of a "Daylight" mantle by means of the Hilger-Nutting spectrophotometer was shown.

Very interesting was the comparison of noises made by various gas jets and burners. A number of triode valves are employed to amplify and rectify a microphonic current pro-

duced by the noise. The microphone employed is of special design; and the sensitivity of the microphone and amplifier is practically constant for all wave lengths. The galvanometer deflection produced thus depends only on the intensity of the sound incident upon the microphone diaphragm.

Of particular interest was a high-pressure gas governor. A constant pressure is maintained within a cylindrical chamber closed on one side by a diaphragm. Any variation of pressure occurring on the outer side of the diaphragm opens or closes a paraboloidal valve, whereby constancy of pressure is maintained at the outlet from the governor. The device can be employed to construct governors operating either at high or low pressures, and was shown operating at a pressure of about 15 lb. per sq. in.; this being maintained constant at an orifice through which air at this pressure was discharged while the supply pressure varied from about 20 to 70 lbs. per sq. in. The discharge was utilized to illustrate the deficit of pressure occurring in a jet of gas—a phenomenon to which the collection of dust round the jet orifice is attributable.

Before concluding this brief and inadequate description of the exhibits, we will refer to a directional form of hot-wire anemometer. Two fine heated wires are arranged in close juxtaposition in the flow tube. The wire upon which the flow is first incident experiences the greater cooling effect—in fact, for slow flows the second wire may experience a heating effect, attributable to the transport of heat from the first wire. The differential effect is utilized to indicate the direction of flow in the system.

Thanks to Dr. Carpenter and his Staff.

After the inspection the party assembled in the Staff Dining Hall, where tea had been provided.

Mr. C. F. Botley said it would be inappropriate if they did not voice their thanks to Dr. Carpenter and his staff for what had proved a real intellectual treat. The standard of working which the South Metropolitan Company set was well known to them all; and they had enjoyed the opportunity of seeing how this standard was kept up. They had been able to appreciate how the Company were investigating problems of vital importance; and they would all be glad to hear that Dr. Carpenter had told him that the Institution of Gas Engineers could have the benefit of the information accruing from the research in the Company's laboratories. [Applause.] He had known the South Metropolitan Company all his life, and it had always been a source of inspiration to him. He had the greatest pleasure in proposing a vote of thanks to Dr. Carpenter and his staff. If those present only remembered a fraction of the information which they had gained through the visit, they would benefit exceedingly.

The vote of thanks was seconded, and carried with acclamation.

Dr. Carpenter, who, on rising, was greeted with prolonged applause, said he was very gratified with such a warm reception on such a warm afternoon. The Institution, as a result of their inspection, had received a mental picture which they should register carefully. Work of a character analogous to that carried out in the laboratories of the South Metropolitan Company was being undertaken by the electricity industry, who were busily investigating the various phases of the use of electricity for heating and lighting. They were dealing with such questions as the efficiency of electric lamps, the influence of inert gases, the effect of bulb shape, and a hundred and one other matters which were essential and which played such an important part in the progress of that industry. Day after day and week after week this type of research work was being done in the laboratories of the British electricity companies; and it was this work which had paved the pathway of progress in the electricity industry. He ventured to say that the gas industry, in spite of the good work done by its various societies, was not in such a fortunate position. For example, research in gas mantles was in the main left to the manufacturers, who did not regard their work with the broad outlook necessary for full efficiency from the gas industry's point of view. The same thing applied to the efficiency of fires, and so on; and he very much regretted the imperfection of this position. One of the experiments which the visitors had been able to see was concerned with particles of dust and their effect on a gas burner. To this end a balloon had been used effectively. They might ask: Why bother about dust? Well, it was by no means uncommon to find that small craters of dust particles had grown round the little holes in the burner injector; and in course of time these prevented the proper flow of gas, and reduced its momentum and pressure. The experiments carried out by Dr. Thomas had enabled them so to modify the construction of their burners as to minimize the chance of dust blocking-up the injector. Another point he would mention was the production of a tar suitable for use on roads. They had determined the characteristics of bitumen which were alleged to make this material particularly suitable for road surfacing, and these, if further experience showed them to be desirable, could be reproduced in the coal tar product. One of the major difficulties experienced was that roads were often treated with tar in a very unscientific manner. Then they had to deal with the prejudices of the public on the question of the pollution of streams as a result of using tar on roads. The South Metropolitan Gas Company were producing a tar which had not the toxic effect on fish which ordinary tar had. He would also refer to the important question of modern methods of gauging the different parts of appliances, to ensure accurate interchangeability. It was still quite a common experience to have deliveries of pipe of one stated diameter in which the different threads had not the same diameter. Standardization of plugs, taps, &c., had to be done in a more satisfactory manner. In regard to wrought-iron and steel barrel, it was a fact that in some parcels they found 75 p.ct. of steel and 25 p.ct. of wrought-iron pipes; and the number of pipes rejected in twelve months was enormous. They were endeavouring to instal only wrought-iron barrel for both external and internal services, for it was, he thought, generally recognized that wrought iron was preferable to steel. There was much to be done to perfect the efficiency of gas supply. To mention another thing, all appliances should have accurately fitting and gas-tight taps. The South Metropolitan Company had set themselves definite standards of mechanism, manufacture, and accuracy. On behalf of the staff and himself, he thanked them most sincerely for their expression of appreciation.

Motor coaches were in readiness to convey the visitors back to Westminster; and on all sides one heard expressions of appreciation of an afternoon well spent. Once again the South Metropolitan Gas Company had given expression to their underlying motive—progress through efficiency. Memories of the highly interesting visit will not be readily effaced.

Electrical Manufacture of Carbon Black.

Indicating the lines of suggested improved apparatus for making carbon black from gas oil, kerosene, or other liquid hydrocarbons, Mr. J. J. Jakosky, of the United States Bureau of Mines, says, in Technical Paper, No. 351, that the oil would be placed in a suitable storage tank, and then pumped to counter-current gas scrubbers. From the header the oil would flow down through the scrubbers into the treating chamber. After passing through the arc or treating chamber, the treated oil would flow to a settling tank. In the settling tank the clear oil would gradually rise to the top, and pass out through an overflow, either back to the original storage tank or to stills for re-distillation. The carbon from the settling tank could be drawn out near the bottom, in the form of a sludge, and then treated. The gas produced during the decomposition of the oil in the arc chamber would be passed through the scrubber, counter-current to the incoming oil, and out of the gas outlet at the top of the header. This gas coming from the arc chamber contains a large amount of carbon in suspension; and it was found that thorough scrubbing was necessary in order to remove it. In order to aid the scrubbing process, it might be beneficial to have the entire system under pressure, in which case the pressure valve at the top of the header could be adjusted. The effects of pressure upon the carbon formation are not known; but to Mr. Jakosky it seems probable that a high pressure would tend to keep the oil in closer contact with the arc, prevent much volatilization of the oil, and thereby ensure higher efficiency. For manufacturing carbon black by the process described, the main essentials are cheap electric power and cheap light-oil distillates.

Fire at a Meter Works.—Damage estimated at several thousands of pounds has been caused by a fire at the works of Messrs. George Wilson Gas-Meters, Ltd., in Foleshill Road, Coventry. Three departments were gutted, and some damage was done to other portions of the premises and stock; but owing to the prompt work of the employees and the city fire brigade, the main building was saved. The cause of the outbreak has not been ascertained; but it is supposed to have been due to the heat of the sun acting upon the contents (straw and similar material) of a corrugated iron packing shed, situated on land adjoining the factory. At any rate, it was here that the conflagration originated.

Luton Gas Company Shares.—Last week Messrs. Cumberland & Sons, Auctioneers, offered at Luton 2000 new ordinary shares, class F, of £10 each, for sale on behalf of the Luton Gas Company, and described them as the "only local gilt-edged security." The standard dividend on these shares is 5 p.ct. per annum, but they are on a sliding-scale dependent on the price of gas, and for the past two-and-a-half years the dividend has been 8¼ p.ct. This new issue is made to provide capital for extensions of the undertaking, which has increased its output by more than 100 p.ct. in 18 years. The shares were offered in lots of two, five, and ten; each buyer of a lot having the option of taking the four following lots. A number of the earlier lots were sold at £13, but as the sale proceeded the price fell successively to £12 17s. 6d., £12 12s. 6d., and £12, which then became the standard. When the sale was adjourned, more than half the issue had been disposed of, and further sales at the £12 figure have since been made privately.

THE GAS EXHIBIT AT WEMBLEY.

THE WEMBLEY CLUB ROOM OF THE SOCIETY OF WOMEN JOURNALISTS IN THE ADMINISTRATIVE OFFICES OF THE GAS EXHIBIT.

The room is placed at the disposal of the Society by the Gas Exhibit Committee as a club room and meeting place for members and their friends, both from England and from the Overseas Dominions, during the run of the Exhibition. The panelling and furnishing of the room has been carried out by Messrs. Osborne & Co., of Grafton Street.

MODEL DOMESTIC LAUNDRY IN THE GAS EXHIBIT AT WEMBLEY.

The laundry is suitable for a large house or small hotel, and is equipped with gas-heated hot water circulator, supplying the sink, low-pressure domestic gas-irons, a high-pressure gas-iron, a high-pressure "Gladiron," and a gas-heated drying cabinet.

Possibilities in Bye-Product Recovery.

Selecting some of the bye-products of coke-oven practice which appeared to him to hold out the greatest promise of successful exploitation, Mr. R. L. Robinson, in a paper before the Northern Section of the Coke-Oven Managers' Association, referred to tetra- and deca-hydronaphthalenes, which are prepared by the combination of highly-purified naphthalene and hydrogen, under pressure and at a temperature of 200° C., in the presence of a suitable catalyst. Two hydrocarbons—known technically as tetralin and dekalin—have obtained a considerable degree of importance in Germany; and a special plant for their manufacture has been erected at Rodleban, with a capacity of 120 tons per day. They are both mobile, colourless liquids, and have found extensive use as turpentine substitutes, as solvents and chemical cleansers, for new dye intermediates, and as motor fuels. Their greatest claim, however, according to the author, is as turpentine substitutes. They have been used with much success in Germany in the manufacture of paints and varnishes, although it is said that they did not give an altogether satisfactory result with white paint and enamels. In connection with these two compounds, it was pointed out in the paper that the world's output of turpentine is 30 million gallons annually, three-fourths of which comes from the United States. The demand generally keeps pace with the supply, and this being the case, there should be a ready market for efficient substitutes.

CENTENARY OF BENZENE.

Faraday's Discovery.

There was celebrated yesterday, by a series of imposing functions, the centenary of the discovery of benzene by Faraday in the laboratory of the Royal Institution, where he worked for fifty years. In the morning appreciations of Faraday were delivered at a reception held by the President and members of the Royal Institution, in association with the Chemical Society, the Society of Chemical Industry, and the Association of British Chemical Manufacturers; and in the evening there was a banquet.

The "Daily Telegraph," referring in advance to the matter, said: "Not since the Royal Institution celebrated the centenary of Faraday's birth in 1891 have the members called together a more notable gathering of world scientists; for there will be some hundreds of guests famous in the world of chemistry and the innumerable allied chemical industries. As Prof. Armstrong said at an at-home held at the Institution: 'No single subject known to chemists has had such a vast progeny of useful bye-products as benzene—as we chemists call it—or benzole as the public and motorists in particular call it. It is really the hub of the chemical dyestuff universe, which has been responsible for setting scores of chemists and investigators developing Faraday's discovery and its application to a great variety of commercial uses. It is not too much to say that since 1870 two-thirds of organic chemical research has been devoted to the study of benzene and its derivatives. Faraday, as all students know, started work here as the assistant to Davy, and succeeded him. He worked here in the laboratory continuously for some fifty years; and the very first specimen of benzene made by Faraday and labelled by him is to be seen here. Faraday had been interested in the subject from 1818 onward; but it was not until June 16, 1825, that he communicated his discovery to the Royal Society. It was, indeed, an epoch-making discovery, and Faraday lived long enough to see the production of the first aniline colour, and to foresee, no doubt, something of the enormous development that would follow his discovery. But he himself, having made his fundamental discovery, like an artist, turned in search of new worlds to conquer, and applied himself to research in electricity, in which sphere his wonderful investigations rather overshadow his earlier experiments in the production of benzene.'"

Fish Drying by Gas.

The drying and smoking of fish has, according to Mr. Joseph W. Piatt, of the Brooklyn Union Gas Company, become an important industry in that city, and now engages the entire attention of several large firms—among the foremost of whom are Messrs. Oxenberg Bros., whose plant is illustrated in the "Gas Age Record." The plant, it appears, was built in 1924 for the exclusive purpose of smoking and handling fish. It is one of the largest and most modern plants for this purpose in the United States. It contains two large smoke-houses for drying and smoking salmon, and twelve small smoke-houses for the other varieties of smoked fish. Each of these smoke-houses is equipped with gas burners. Gas is the fuel used, because of the ease with which the work is done, and the better quality it gives to the products. This installation has a capacity of 250,000 lbs. of smoked fish per week, and an increasing business is demanding an enlargement of the plant facilities in the near future. The firm are enthusiastic believers in gas as the most excellent of fuels for use in their work. Gas for drying, and wood chips and shavings for smoking are the only fuels used in this plant to-day.

Gas Favoured in Brass Foundry.

It is stated by the "American Gas Journal" that a Rhode Island foundry which used to throw away 25 p.ct. of its expensive brass and bronze castings because they proved defective when tested, changed its fuel from coal to gas. Its rejections dropped to only 3 p.ct., and at the same time operating costs were reduced and the working conditions for the men greatly improved. The firm had tried every process they could discover with coal as the fuel; but although there were certain advantages, they could not get away from the fatally high percentage of defectives. Extensive experiments were made with coke and oil; but they were not materially better. When gas was tried, the firm specified that "it must reproduce the ideal conditions of melting with coal, but have none of the objectionable features." The gas "made good." It was found that with gas a desired temperature or furnace state could be reached at will, regardless of atmospheric conditions, and that this could be reproduced exactly for batch after batch of the alloys. The gas eliminated the labour of building fires hours before the start of the work, cleaning the fires, carrying out ashes, and handling new fuel. It also did away with the smoke, dirt, and terrific heat around the furnaces, which prevented the "melter" from giving his best attention to the work. The men liked this change so much that they did more and better work.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Economics of Gas Production on the Therm Basis.

Sir,—Owing to unavoidable delays, many members were unable to obtain advance copies of my paper read before the Institution on Thursday, and I find several were anxious to take part in the discussion and have further points explained, but were prevented from doing so owing to their inability to obtain advance copies and the shortness of time available for discussion.

I was able to deal with one or two queries after the meeting, and I shall be happy to answer any further points by correspondence with individual members.

I take this opportunity of writing because, after the paper, one member (whose name I have forgotten) spoke to me near the platform, and I requested him to wait a minute or so, to enable me to deal with another matter. Unfortunately I was detained much longer than the time indicated, and when I returned the particular member had gone.

George Evetts.

Palace Chambers,
Bridge Street, Westminster, S.W. 1,
June 13, 1925.

REGISTER OF PATENTS.

Gas-Heated Bakers' Ovens.—No. 233,054.

Vicars, E. L., of Earlestown.

No. 2806; Feb. 4, 1924.

This invention relates to gas ovens for baking bread, biscuits, &c. In the type of oven wherein the goods are transported on chains, it has been found that, owing to the chain and to the channel supports for the chain being interposed between the lower burners in the oven and the trays supporting the goods, the bottom surface of the article to be baked at those points above the chains is not coloured to the same degree as the other portions. It has previously been proposed to interpose baffles, which may be perforated, between the burners and the goods in order to maintain a substantially constant temperature in the oven.

The oven of the present invention has a complete perforated floor which comprises chain rails for supporting a conveyor and baffle plates situated between successive chain rails and between the outside rails and the side walls of the oven.

The baffle plates are dished, with their upper edges meeting the upper edges of the rail channels; and the perforations are so graded as to give a preferential path through the channels to the hot combustion products.

Coke Separator.—No. 233,200.

Rigby, J., of Hackney, N. 1.

No. 16,908; July 15, 1924.

This invention is for a type of coke separator working on the flotation principle.

According to the invention the apparatus comprises a water tank divided into upper and lower communicating compartments, a rotary conveyor in the form of a bucket wheel rotating in the upper compartment, and an endless chain bucket conveyor operating in the lower compartment. The upper compartment is also provided with a chute to discharge the material from the bucket wheel outside the tank; the chain conveyor also discharging outside the tank.

In operation, the mixture to be separated is fed into the upper compartment on to a slotted plate beneath the bucket wheel. The heavier clinker falls into the lower compartment, while the coke floats and is picked up by the bucket wheel and discharged on to the chute. The clinker is removed from the lower compartment by the chain conveyor and discharged.

The churning of the water by the bucket wheel assists in the flotation of the coke; but if the coke is of such a nature that it does not float, coal may be fed into the upper compartment, and cutters attached to the bucket wheel churn up the clay, increasing the density of the liquid. The buckets on both convevors are perforated; and the material may be fed in through a rotary sieve. Suitable gearing is provided for driving the apparatus by hand or power.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

The Standing Orders not previously inquired into which are applicable to the following Bills have been complied with: Blackpool Improvement, Oldham Corporation, and Uckfield Gas and Electricity.

The Bath Gas Light and Coke Company have withdrawn their petition against the Bath Corporation Bill.

European Gas Company, Ltd.—The Directors have, subject to audit, decided to recommend the payment, on Aug. 1 next, of a final dividend of 6s. per share, free of income-tax, which, with the interim dividend paid on Jan. 31 last, represents a total dividend of 5 p.ct., free of income-tax, for the year ended March 31. For the year 1923-24, a dividend of 4 p.ct., free of income-tax, was paid.

LEGAL INTELLIGENCE.

DEUCHAR v. THE GAS LIGHT AND COKE COMPANY.

HOUSE OF LORDS.—Thursday, June 11.

(*Before Viscount* CAVE (*Lord Chancellor*), *Lord* DUNEDIN, *Lord* ATKINSON, *Lord* SUMNER, and *Lord* BUCKMASTER.)

The appeal of Mr. John Lindsay Deuchar against the dismissal of his application for an injunction to restrain the Gas Light and Coke Company from manufacturing their own caustic soda for the purpose of working up residuals was considered by the Lords of Appeal on Thursday, June 11. Their Lordships, without hearing Counsel for the Gas Company, were unanimous in their decision to dismiss the appeal. (The proceedings in the High Court and in the Court of Appeal were reported in the "JOURNAL" for Jan. 23, 1924, p. 210; May 28, 1924, p. 611; and June 25, 1924, p. 911.)

Appellant was represented at the House of Lords by Mr. A. C. CLAUSON, K.C., Mr. DIGHTON POLLOCK, and Mr. J. L. MURPHY. Respondents were represented by Sir JOHN SIMON, K.C., Mr. W. A. GREEN, and Mr. A. ANDREWES UTHWATT.

Mr. A. C. CLAUSON, K.C., opening for the appellant (who is Secretary of the Castner Kellner Alkali Company, Ltd.), said that, as a holder of a small sum of stock in the Gas Light and Coke Company, he was bringing an action against them with a view to testing the limits of the powers of the Company. Though the action was brought by the appellant as a holder of stock in the Company, Counsel said that he did not wish for a moment to conceal the fact that the action was brought in the interests of certain traders, who took the view, rightly or wrongly, that the Company were exercising certain activities which they were not authorized to exercise. The question to be decided was purely a matter of the construction of the Acts which regulated the Company. The facts, in substance, were not in dispute. The Company had erected a factory for the manufacture by the electrolytic process of caustic soda required for the purpose of treating their naphthalene, and the erection of that factory was not within the powers of the Company. Counsel went on to explain that the caustic soda was to be used for converting naphthalene into beta-naphthol, and that the manufacture of caustic soda by the electrolytic process produced chlorine as a bye-product. Neither caustic soda nor chlorine was a residual of gas. The chlorine was got rid of by turning it into bleaching powder, which latter the Company sold. Counsel pointed out that with caustic soda and chlorine one could make an enormous number of saleable combinations.

Counsel then quoted at length from the evidence given in the lower Courts with regard to the manufacture and uses of caustic soda and chlorine.

Lord BUCKMASTER, having obtained the admission from Counsel that the Company were competent, within their Charter, to convert naphthalene into beta-naphthol, said he understood the appellant's case was that they must not produce the caustic soda for that purpose, but must buy it elsewhere. He pointed out that the Company had not sold the caustic soda they had made.

Mr. CLAUSON said his case was that the Company could not manufacture it.

The LORD CHANCELLOR said that, assuming the Company were entitled to manufacture caustic soda for treating residuals, they could not do this without incidentally producing chlorine. There was no evidence to show that the chlorine had been used for treating other residuals, but there was evidence that it might be so used. Assuming they did not use it for treating other residuals, could they not produce it?

COUNSEL replied that what the Company did was to get rid of the chlorine by setting-up another plant, and producing another thing altogether.

The LORD CHANCELLOR pointed out that they must get rid of the chlorine.

COUNSEL said his argument would be based on the fact that the Company were given express powers to manufacture various things, but none of the things included caustic soda.

Coming to the relevant sections of the Company's Acts, Counsel dealt first with section 40 of the Act of 1868, which stated that the Company may "make and store and supply gas, and may convert, manufacture, and deal with, sell, or dispose of, coke, tar, coal, pitch, asphaltum, ammoniacal liquor, oil, and all other products, refuse, or residuum arising, remaining, produced by, or obtained from, the making by them of gas, or the materials used therein, and may make and sell all articles produced from, or by means of, those several matters, . . ." His contention was that there was nothing there that could possibly be suggested as authorizing the manufacture of caustic soda.

Lord BUCKMASTER said there was nothing which expressly conferred upon the Company the right to manufacture the reagent used for the conversion of naphthalene into beta-naphthol, but whether or not it was implied was a matter to be determined.

COUNSEL's submission on Clause 40 of the 1868 Act was that it was a very strong line to seek to find in that clause, by implication, a power to manufacture something which was not named.

Lord ATKINSON said there was no power for the Company to manufacture electricity, but yet it might be a reagent for dealing with residuals.

COUNSEL replied that, as a matter of fact, the Company did generate their own electric power.

Lord ATKINSON asked whether the argument would not be the same in that case.

COUNSEL said he was by no means prepared to say that it was within the power of the Company to generate electric power.

Lord BUCKMASTER pointed out that the object of the Statute was to give the Company limited powers of trading. Was it not also to enable them to do all things necessary for the purpose of efficiently carrying on that trade?

COUNSEL said it was.

Lord BUCKMASTER asked why, if it were necessary for the efficient carrying on of the trade that they should provide themselves with this reagent cheaply, instead of buying it from outside, the Company should not do it. If they were selling caustic soda outside, it would be quite a different proposition, but they were providing it for the purpose of their undertaking.

COUNSEL replied that their Lordships were basing the power to manufacture caustic soda on something which was implied by reason of the power given to carry on another process in the most advantageous and satisfactory way. The point was that, if they could get it perfectly well without manufacturing, why manufacture it, when their powers of manufacture were expressly limited?

Lord BUCKMASTER, in the course of discussion, said it was not unlikely that what the legislature meant was this. Having given the Company power to make gas, unless they also gave power to manufacture things necessarily resulting from the manufacture, the Company would not be able to make the gas. Therefore, they had given the Company power to make things resulting from the manufacture of gas. The Company could convert and make, deal with and sell, all those products arising from the making of gas, as mentioned in Clause 40 of the 1868 Act, and could make and sell all articles produced from, or by means of, those several matters. This must mean something more than the making and selling of the things which were mentioned, and, therefore, it must mean that they might make and sell all the things necessary for the conversion of those products.

JUDGMENT DELIVERED.

Judgment was delivered in favour of the Gas Company without their Counsel being called upon to respond to the arguments put forward on behalf of the appellant.

The LORD CHANCELLOR, in his judgment, said that, notwithstanding the careful and complete argument addressed to their Lordships on behalf of the appellant, he did not feel any doubt as to the correctness of the decision of the Court of Appeal in this case. The respondent Company, the Gas Light and Coke Company, was formed by Statute for the purpose of making and selling gas; and in the course of making gas from coal, the Company necessarily produced a number of residual products. It was obviously undesirable that these residuals should be wasted if they could be so dealt with as to acquire a money value, and it was not disputed that the Statutes under which the respondents acted authorized them to convert these residuals into a marketable state. In a reference to the production of naphthalene and its conversion to beta-naphthol, he said the conversion was best effected by the use of caustic soda, and the respondents did convert their naphthalene into beta-naphthol in that way. For a time they had provided the necessary caustic soda by purchase, but recently they had commenced, presumably for purposes of economy, to manufacture it themselves. It appeared from the evidence that the respondents only produced in this way so much caustic soda as was required for the purpose of converting their naphthalene into beta-naphthol, and that they only used caustic soda produced by themselves for this purpose. Chlorine could be used for converting other residuals; but it did not appear upon the evidence that chlorine, which was a bye-product of the manufacture of caustic soda by the respondents, was used only for that purpose. It appeared that at all events some of the chlorine had been converted to another purpose, and was so used. The appellant was the Secretary of another Company which apparently dealt in caustic soda, but, being qualified for the purpose of bringing this action by the purchase of shares or stock in the respondent Company, he had taken the objection that the latter Company had no power under their Statutes to manufacture caustic soda, even for use in converting their naphthalene into beta-naphthol; and he had brought this action claiming an injunction to restrain them from making caustic soda. The action was dismissed by Mr. Justice Astbury, and the decision stood confirmed by the Court of Appeal. There was no dispute as to the legal propositions which were to be applied in this case. It was enough to refer to the rule as laid down by Lord Watson in the case of *Baroness Wenlock v. the River Dee Company*, when he had said: "Whenever a corporation is created by Act of Parliament, with reference to the purposes of the Act, and solely with a view to carrying those purposes into execution, I am of opinion not only that the objects which the corporation may legitimately pursue must be ascertained from the Act itself, but that the powers which the corporation may lawfully use in furtherance of those objects must either be expressly conferred or derived by reasonable implication from its provisions." To this statement, the Lord Chancellor added a sentence from the speech of Lord Selborne, in the case of the *Attorney-General v. the Great Eastern Railway Company*, in which he had said: "I agree with Lord Justice James that this doctrine of *ultra vires* ought to be reasonably, and not unreasonably, understood and applied, and that whatever may fairly be regarded as incidental to, or consequential upon, those things which the Legislature has authorized ought not (unless expressly prohibited) to be held, by judicial construction, to be *ultra vires*."

With these statements of law in mind, the Lord Chancellor turned to the Statutes of the Gas Light and Coke Company. The first material section was section 40 of the Company's Act of 1868 (part of which he read). Applying that section to the particular facts of this case, it appeared to him to result in this, that the Company might convert and deal with naphthalene. In other words, they might treat naphthalene by converting it into some other marketable product. It was plain that, for the purpose of so converting naphthalene in the best way, they must have caustic soda, and accordingly the provision of caustic soda was incidental to the conversion of naphthalene. The only point was whether this caustic soda must needs be provided by the method of purchase, or whether it was in the power of the Company as incidental to their powers to convert, themselves to manufacture caustic soda. If that section stood alone, it would appear to him to be reasonably plain, on the facts of the case, that the manufacture of caustic soda was incidental to the process of con-

version of naphthalene into beta-naphthol, or, in other words, that the manufacture of caustic soda was a part of the process of conversion.

But the Statutes did not stop there; and His Lordship went on to deal with section 43 of the same Act. He considered that the section, properly read, did authorize the Company to convert its naphthalene into beta-naphthol, and to provide the necessary materials for that purpose. Again, under that section, he saw no reason why the materials should not be provided by the process of manufacture, or why they should only be provided by the process of purchase.

After quoting the other relevant sections of the Company's Acts, His Lordship said that, if it could be suggested that the Company in this case were engaged in manufacturing caustic soda for the purpose of sale, the result might be very different; but he considered it was plain from the evidence that they were doing no such thing, and that they were making caustic soda only for the purpose of using it in the process of converting one of their residuals into a marketable product.

As regards chlorine, this appeared to be a small matter. Chlorine was not made for the sake of making chlorine; it was a necessary bye-product evolved in the process of making the caustic soda. Chlorine might be, and possibly would be, used for converting some residuals into something which could be sold, but, in any case, it must be got rid of by the Company; and he did not think the plaintiff had said, in his pleadings, that it was the fact that the Company, in that respect, were going beyond their powers.

In summing-up the case, His Lordship adopted the statement by Lord Justice Warrington in his judgment on the present case in the Court of Appeal, when he had said: "My view in reference to the facts of this case may be thus summed-up. The defendant Company have express powers to convert naphthalene into beta-naphthol; they have by reasonable implication a power to provide the proper reagent for that purpose—namely, caustic soda—a proper and reasonable means of providing that substance is to make it, and, to do so not being excluded, they have by reasonable implication the power to provide the substance by that means."

Therefore, the Lord Chancellor moved that the appeal be dismissed, with costs.

Lord DUNEDIN said he had not felt any doubt that the decision of the Court of Appeal was right. Their Lordships had been favoured with a very careful and minute analysis of the various Statutes which applied to the Company. Speaking for himself, he did not think the case was much helped by, or depended on, such analysis. He looked upon such Statutes as merely exegetical of the leading Statutes, and section 40 of the Act of 1868, in ordinary and non-technical language, seemed to him very clearly to authorize the Company to put the residual products into such a shape as to make them commercially valuable. Then they had to see whether what was done fell within the dictum of Lord Watson which had been quoted by the Lord Chancellor. The Company must have reagents for dealing with those residual products; and he could not see that there was really any difference between buying the reagents and providing them by manufacture in their own works. At the same time, if a case had been made out that, under cover of doing something incidental to the proper exploitation of waste products, the respondents were really entering the market as producers of some product not itself a residual product, and thereby really becoming manufacturers of some other articles than those which they were allowed to manufacture under their Statutes, they might, he considered, have been restrained. But no such case had been made; and he considered the appeal failed.

Lord ATKINSON said he thought the judgment in the Court of Appeal was right, for the reasons given in the separate judgments there.

Lord SUMNER and Lord BUCKMASTER concurred.

The appeal was formally dismissed, with costs.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for June 4.]

Nos. 13,541-14,233.

COWAN, Sir H.—"Safety devices for gas-heated apparatus." No. 14,016.

DRAKE, J. W.—"Valves for gas, &c., mains." No. 14,114.

DRAKE, J. W., and DRAKES, LTD.—"Apparatus for treating coke discharged from retorts, &c." No. 14,116.

FINLAYSON, T. C.—"Manufacture of gas." No. 13,767.

HARRISSON, F. J.—See Drake, J. W. No. 14,114.

JOHNSON, C.—"Gas heating burners, &c." No. 13,562.

KIRKHAM, HULETT, & CHANDLER, LTD.—"Apparatus for effecting intimate contact between liquids and gases." No. 13,657.

PARKINSON STOVE COMPANY, LTD.—See Cowan. No. 14,016.

REBER, J. W.—"Dry-quenching coke." No. 13,618.

SLATER, W. F.—See Kirkham, Hulett, & Chandler, Ltd. No. 13,657.

SMITH, E. W.—See Finlayson, T. C. No. 13,767.

STANIFORTH, H.—"Apparatus for controlling lighting, &c., of gas burners." No. 13,942.

WOODALL-DUCKHAM, LTD.—"Dry-quenching coke." No. 13,618.

WOODALL-DUCKHAM, LTD.—"Manufacture of gas." No. 13,767.

Mr. Arthur Sainsbury, Secretary to Messrs. Ewart & Son, Ltd., notifies shareholders that his Directors have declared a dividend for the half-year ending June 30, 1925, on the preference shares at the rate of 16 p.ct. per annum, and an interim dividend on the ordinary shares at the rate of 32 p.ct. per annum (or 16 p.ct. for the full year), both subject to income-tax. These dividends are at the same rate as those paid on June 30, 1924, in respect of the first six months of last year. Arrangements have been made with the Liquidator of Messrs. Ewart & Collis, Ltd., for the transfer before June 30 of the shares now held by him in Messrs. Ewart & Son to the shareholders in Messrs. Ewart & Collis, in order that they, as shareholders in Messrs. Ewart & Son, may receive the dividends on the preference and ordinary shares payable upon that date.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following notices have appeared in the "London Gazette" regarding applications to the Board of Trade under the Act.

SPECIAL ORDERS.

Chapel Whaley and District Gas Company.

The Company intend to apply for an Order under section 10, to enable them to use for gas-works purposes scheduled land, to raise additional capital, and to make provisions regulating the supply of gas.

Solihull Gas Company.

The Company notify their intention of applying to the Board of Trade for an Order under section 10 to enable them to acquire additional land, to raise additional capital, and for other purposes.

BIRMINGHAM GAS DEPARTMENT.

The Birmingham Gas Committee, in their report to the City Council, recommend that the prices of gas be increased as from the June readings of the meters, for lighting and domestic purposes, up to and including 100,000 c.ft., from 2s. 10d. per 1000 c.ft. to 3s. 2d. The percentage increase of the suggested price over Midsummer, 1915, is 58·33. Other prices are also raised.

The Committee, in an explanation for the increase, point out that in June last year they commented on the reductions in price which had been made during the preceding twelve months, and drew attention to the fact that residual products were then showing signs of weakening, and that there had been a considerable fall in the value of tar products. This made the position one of much anxiety, as there was very little margin in the existing scale of charges. Unfortunately there had been a continued slump in residual products, which had so adversely affected the finances of the Department as to make it necessary to increase the price of gas. The fall in the revenue from tar during the year was nearly £70,000, notwithstanding that a larger quantity was produced in the year ended March, 1925; and it was interesting to note that, if values had been maintained at the level of the previous year, additional revenue to the extent of £94,757 would have been provided. After taking into account the increased quantity of ammoniacal liquor made and sold during the year, the fall in value of this residual has resulted in a loss of revenue equal to £21,644. A reduction of 5s. per ton had to be made recently in the price of coke, owing to the increasing stocks and the general reductions in price made by other gas undertakings, which made it very difficult to obtain sufficient orders to keep the yards clear of this product. That reduction represented a loss of income of £100,000 per annum. An amount of £60,000 should have been allocated to Nechells Works reconstruction in accordance with the arrangement made with the Finance Committee; but, owing to financial stringency, this could not be done. Provision must, however, be made for resumption of the annual payment in the current year.

As to the annual accounts, the Committee state that they show a deficiency of £78,518, which amount has been transferred from the reserve fund. The expenditure for the year amounted to £2,226,764, a decrease of £117,023, but credit had been taken for an abatement of income-tax on replacement of plant amounting to £63,555. That item would not recur in future years.

The Unemployment Relief Schemes which have been adopted by the Council had involved the Committee in heavy expenditure in altering the position of, and rearranging, gas mains in the thoroughfares which had been improved and reconstructed. The expenditure under this head amounted to £58,733. During the year, 810,110 tons of coal were carbonized—an increase of 10,951 tons over the previous year. In addition 1,734,723 gallons of oil were used in making carburetted water gas. The gas sold amounted to 12,659 million c.ft., the largest quantity sold in any year in the history of the undertaking, and an increase of 5·35 p.ct. over the quantity sold in the preceding year. The increase was no less than 642¼ million c.ft.; and of this quantity approximately 358¾ millions were due to increased demands for lighting and domestic purposes. The average net price realized per 1000 c.ft. during the year was 2s. 5·47d., as against 2s. 9·77d. in the year ended March, 1924.

The two concrete gasholder tanks at the Washwood Heath Works had been satisfactorily completed, and considerable progress had been made with the erection of the holders and framework. One holder would be completed in August next, and the other towards the end of the year. It had become necessary to carry out extensive repairs to 22 beds of vertical retorts at the Windsor Street Works, which had been in operation continuously for five years. The repairs would be carried out during the coming summer when the plant could be let down without inconvenience, owing to the smaller demand for gas. The cost would be approximately £38,000.

Extensions of Gas Mains at Stafford.—At a recent meeting of the Stafford Town Council, the Gas Committee recommended that a 12-in. main be laid along the Wolverhampton Road from Park House to the junction of Burton Lane, a distance of 403 yards, and a 10-in. main along Burton Lane for a distance of 416 yards, at an estimated cost of £1800. The recommendation was carried.

Progress at Ashbourne.—At the monthly meeting of the Urban Council, a report on the gas undertaking for the year ended March 31 last was received, showing a gross profit of £3613. After meeting loan charges, &c., a net profit of £94 remained. The make of gas had increased by 2,572,700 c.ft. to 49,000,000 c.ft. for the year. In view of the anticipated saving in the cost of coal during the current year, it was decided to reduce the price of gas by increasing the discounts to ordinary consumers, but the exact amount of discount could not be fixed until the coal contracts were settled.

SOUTHAMPTON GAS ORDER.

Mr. H. C. HONEY (Director of Gas Administration at the Board of Trade) inquired into an application by the Southampton Gaslight and Coke Company for a Special Order under section 10 of the Gas Regulation Act, on Monday, June 8, at the offices of the Board. The purposes of the Order are to extend the area of supply of the Gas Company and to authorize new provisions with regard to capital and borrowing powers. There are also a number of miscellaneous provisions. The new area which is to be added to the Gas Company's existing area of supply consists of the parishes of Dibden, Marshwood, and Fawley, and the parishes of Bursledon, Botley, and Hedge End. With regard to dividends, a clause in the Order provides that the limitation of dividends to 5 p.ct. per annum on the ordinary capital and 4 p.ct. per annum on the preference capital, which was imposed on capital issued under the Company's Act of 1906, is not to apply to the capital issued after the date of the Order, but the Company are not to pay a dividend larger than 6 p.ct. on such capital, unless a larger dividend is necessary on the ordinary capital to make up the deficiency of any previous dividend. The Company, however, are not to make up a deficiency in any previous dividend after five years from the date when such previous dividend was paid or payable. Borrowing powers are sought by the Company up to one-half of the amount of the paid-up capital. Powers are also sought to issue debenture stock; and the interest on that debenture stock, or on any money borrowed under this Order, is not to be more than 6 p.ct. Powers are also contained in the Order to grant pensions and to adopt a co-partnership scheme.

Originally there were three sets of objections to the provisions of the Order. The first was by the Bursledon Bridge and Roads Company, who asked for protection in respect of the laying of gas mains over Bursledon Bridge and along roads which are owned and maintained by the Bridge Company. The opposition was withdrawn, however, on the insertion of an agreed clause. Another set of objections was raised by the Southampton Corporation; but certain amendments to the Order were agreed between the Gas Company and the Corporation. The third series of objections came from the Southern Railway Company, who asked for protective provisions.

The Railway Company were represented by Mr. W. BISHOP (Solicitor to the Railway Company); and Mr. C. F. BAKER (Messrs. Bircham & Co., Parliamentary Agents) represented the Gas Company.

Mr. BAKER, dealing with the Railway Company's objections, said that one of these related to a clause giving the Gas Company power to lay pipes for ancillary purposes, but a proviso had been added to the effect that the Company were not to lay such mains under any railway of the Southern Railway Company without their consent. The proviso also states that such mains may only be laid in certain specified streets in the borough of Southampton, and then only with the consent of the Corporation.

Another objection by the Railway Company which was disposed of by agreement had reference to the clause relieving the Gas Company of the obligation to supply gas for other than lighting and domestic purposes from mains of insufficient capacity. The Company deleted the clause in the original Order, and inserted in its place the clause recently agreed between the National Gas Council and the Railway Companies, and which has come to be known as the "Pinner" clause. [This clause was inserted recently in the Mansfield Corporation Bill, and is set out in the "JOURNAL" for June 3, p. 677.]

The outstanding objections of the Southern Railway Company arose in connection with a clause which they asked should be inserted in order to protect their interests. Mr. Baker said that the Gas Company were prepared to give a certain measure of protection, and that would be agreed. The Railway Company contended that the provisions of the Gas Works (Clauses) Act, 1847, did not afford adequate protection for their roads, bridges, level crossings, and other works, and asked for special protection. The Gas Company, on the other hand, disagreed that the Act of 1847 did not afford adequate protection, and pointed out that the Gas Works (Clauses) Acts of 1847 and 1871, which were incorporated in their Acts and the present Order, had afforded adequate protection to the Railway Company in the past. If any alteration of the general law were necessary, it should be made by public legislation, and they objected to being placed in a position different from that of other gas undertakings, as the result of the insertion of special provisions in the present Order.

Mr. BISHOP said that the Railway Company were now asking for no more than they had been granted on many occasions. The clause which he now asked should be inserted in the present Order had been amended, and agreement had been reached between the parties, except in respect of two sub-clauses. The first of these related to the carrying of mains under railways by the Gas Company, and provided that the Gas Company should restore and make good, to the reasonable satisfaction of the Railway Company's engineer, the railways which might be disturbed or interfered with. The discussion arose on a proviso which it was proposed should be added, to the effect that, if the Engineer of the Railway Company should think it necessary in any case for the works of the Gas Company (other than the actual laying down of mains or pipes) to be executed or carried out by the Railway Company, such works might be carried out by the Railway Company, and the reasonable expense incurred by them should be repaid to them by the Gas Company.

It was pointed out by Mr. Bishop that the present case, so far as the Railway Company were concerned, was exceptional. A new railway was being built, the greater part of which was included within the proposed extended area of supply of the Gas Company. This line had been difficult to construct, owing to the nature of the subsoil and the waterlogged condition of the country. The Railway Company's Engineer feared that the maintenance of this line would be difficult for some time to come, and was afraid that work might be carried out by the Gas Company which would seriously jeopardize the Railway Company, and which might lead to the suspension of traffic. He wished to guard against this.

Mr. BAKER remarked that the Gas Company were anxious to do all they could to avoid difficulty.

Mr. *A. W. Salumper* (Chief Engineer to the Railway Company), in evidence, referred to a case in which works carried out by a county council had resulted in damage to the railway, which had had to be repaired at considerable expense. If the proviso asked for by his Company were inserted in the present Order, the Gas Company would not be put to any expense; on the contrary, the probability was that the Gas Company would be saved expense. After many years' experience, he had come to the conclusion that some such definite protection was needed by railway companies.

Mr. BAKER, in the course of discussion, said that if it were made clear that the works which the Railway Company were allowed to carry out were limited to supporting and protecting their railways, he did not think the Gas Company would object. The proviso in its present form would leave the Railway Company power to fill in a trench after a gas main was laid; but, if it were not filled in properly and the gas main fractured as a result, who would be responsible?

Further discussion then ensued in order to arrive at a suitable wording of the proviso in question, and finally Mr. Honey suggested that the parties should consult privately. His suggestion was adopted; and it was subsequently agreed that the Railway Company should have power, if their engineer thought necessary, to carry out the works of the Gas Company—other than the actual laying down of mains or pipes, "including the filling in and consolidating of the trench in which such mains or pipes are laid."

The other proposed sub-clause to which the Gas Company objected was one providing that, if any injury or damage to or interruption of traffic on the railways of the Railway Company arose in any way owing to the construction, existence, or failure of the works of the Gas Company, they should make full compensation to the Railway Company.

In the course of the discussion upon this, Mr. Bishop said he did not quite appreciate the Gas Company's reasons for objecting, because it was a provision which the railway companies had invariably obtained in the past.

Mr. HONEY asked to what extent this sub-clause was an extension of the general law.

Mr. BAKER said that at present the Gas Company were only liable in the case of damage caused through their negligence.

Further discussion of the matter ensued, and various forms of wording were considered. Finally, the Gas Company agreed to the insertion of the sub-clause, with the deletion of the word "existence." Thus, they are to be liable to make compensation to the Railway Company for injury or damage to or interruption of traffic arising owing to the "construction or failure" of the works of the Gas Company. Mr. Honey intimated that the Board of Trade would insert the sub-clause in this form.

This disposed of the opposition of the Railway Company.

Consideration was then given to a request by the Southampton Corporation that the charge for gas within the Borough should always be 2d. below the price charged outside. Mr. Baker said that the Gas Company were prepared to put in a provision to the effect that the charge within the Borough should always be less by 2 d. per therm than the highest price charged outside the Borough; but they could not possibly agree to a provision which might have the effect of making them charge considerably less than the amount they ought to charge in Southampton. On the outside fringe of the Borough they would not charge the maximum, but the lowest price they could charge, and it would not be fair to make the Company reduce the charge in the Borough accordingly. On the outside limits of supply, the Company were charging the full differential, whereas on the fringe of the Borough they were not.

Mr. HONEY said that the Southampton Gas Company's Act of 1898 contained a proviso that, if the prices were increased, the increase should be made uniformly over the whole of the limits. There was no provision, however, that reductions should be uniform. In effect, therefore, the Corporation were asking that if there were a difference at present between the prices in the Borough and the outside areas, that difference should be stereotyped for a time. He asked how the figure of 2d. was arrived at.

Mr. *J. R. H. Jacobs* (General Manager to the Company) said that was the figure given in the Company's Charges Order of 1921, where it was laid down that the maximum prices should be 16d. and 18d., in place of the maximum prices given in the Act of 1898—namely, 3s. 6d. and 4s. 6d. per 1000 c.ft.

Mr. HONEY said there was no differential mentioned in the 1898 Act, but two maximum prices, which could be dealt with independently so far as a reduction was concerned, but which must be dealt with alike so far as an increase was concerned.

Mr. *Jacobs* agreed.

Mr. HONEY said that, having regard to the practice of the Company in the past with regard to these differential prices, and to the fact that in 1898, when the maximum price in the outside districts was fixed, there was no provision that the Company were for a time to charge a higher price in the outside district than in the inner district, he was not disposed to recommend the Board of Trade to insert anything in the present Order. It seemed to him that what the Corporation were now asking the Board of Trade to do was not merely to affect the price in the new area, but to affect the price in all the districts now supplied by the Company outside the Borough, which latter were dealt with by the Act of 1898. Certainly, without hearing representatives of the outside districts, he would hesitate to put the Company under an obligation to charge a higher price in those districts for a time than was charged within the Borough. He considered that an important change of this kind ought not to be made without giving the people affected an opportunity of being heard.

Another matter discussed was a clause in the present Order giving the Company power to levy such charges as they thought fit for taking the reading of any meter fixed in a house, which was either in whole or in part let furnished at times other than those of the Company's

periodical readings. There was a proviso to this clause, to the effect that for each reading taken within the Borough as constituted at the date of the Order such charge should not exceed 1s. Mr. Honey asked why the maximum charge of 1s. should be confined to within the Borough. The reply was that this was due to the special circumstances of the Company. The area covered was a large one, and the offices were situated in Southampton. The fee should be kept as low as possible within the Borough, but it was considered reasonable that it should be higher at the extreme limits of the area. The probability was that in the immediate neighbourhood of the offices of the Company the charge would be less than 1s., and perhaps nothing at all. On the other hand, if a special reading were made on the extreme edge of the area, a man would have to travel about 14 miles each way for the purpose. Often the Company received notice at the last minute that a house was changing hands, and the outgoing tenants wanted the meter read and the account left the same day. This meant sending a man specially from the office to read the meter and collect the money.

Mr. HONEY intimated that the clause could be inserted as put forward.

The inquiry then closed.

SAFEGUARDING OF INDUSTRIES ACT.

Gas Mantle Inquiry.

(*Continued from p.* 749.)

Tuesday, June 9.

The Committee concluded their proceedings on Tuesday, June 9.

Herr *Heinrich Zeigler* re-entered the witness chair, and handed to the Committee copies of wages agreements into which his Company had entered recently. These had been asked for previously by the Chairman. A statement as to the taxes payable in Germany was also produced.

Witness was then cross-examined by Mr. Soper (for the applicants), whose object was to show that Herr Zeigler's Company was an amalgamation of a number of foreign mantle manufacturing concerns, and to emphasize that the opposition to the present application was in effect the opposition of foreign manufacturers, and was not representative of the general body of importers in this country. His questions were shortened, however, by an intimation from the Chairman (Sir Frederick Mills) that this was quite clear.

Witness made a correction to his previous evidence with regard to the cost of carriage, freight, and insurance from the German factory to the port of discharge in the United Kingdom. This he had said was 3s. per gross; the wholesale price in Germany was 3s. below the wholesale price here, so that he was sacrificing nothing by exporting to this country. He now said, however, that the cost of carriage, freight, and insurance was 2s.

With regard to prices in this country, witness agreed that during 1923 (when there was a duty on German mantles under Part II. of the old Safeguarding of Industries Act), his prices here were less than the prices operating at the present time. He admitted that those 1923 prices were based upon those ruling in this country, and not upon his production costs, the reason being that, owing to the inflation of German currency, he did not know what his production costs were. At present, however, prices were based on production costs, which he could ascertain because the German currency was stabilized. The stabilization took place about November, 1923; and although the low prices charged yielded his Company a profit before that time, they did not yield a profit after stabilization.

Asked what was the present price of standard German mantles in the United States, witness said he did not now export to that country, because the duty was too high.

This concluded the evidence on behalf of the importers who are opposing the application, and further evidence was called on behalf of the applicants.

Mr. *N. W. Buis* (who gave evidence on a previous occasion as to the rates of wages paid by mantle manufacturers in Poland) said he had been to Germany within the last fortnight, and had ascertained from a worker at the Auer Company's factory at Berlin the rates of wages paid there. These were considerably below the figures given by Herr Zeigler. He had also advertised for clerical workers, and the salaries asked for by those who had replied to his advertisement were also low.

Cross-examined by Mr. Macaskie (representing the importers) witness said that before leaving for Germany he had seen the figures which were to be given on behalf of the importers as representing the rates of wages paid by the Auer Company at Berlin. He had not tested these by putting them to his informant.

Mr. *C. S. Garland* (Managing Director of the Clay Ring Company, Ltd.) said that prior to the war the manufacture of clay rings in this country was in German hands, and he believed the business was in close association with the German gas mantle industry. In the early part of the war the factory (which was situated at Earlsfield, London) was taken over by the Custodian of Enemy Properties, and in 1917 the shares were sold under the Trading with the Enemy Act. Several British mantle manufacturers, feeling that it was necessary to remove this important source of raw material from any possibility of foreign control, had combined to purchase the shares of the business. The output of the factory had proved to be insufficient for the demand in 1917 and 1918, and two other factories were purchased—one at Nottingham, and the other at Ashby-de-la-Zouch, in Leicestershire. In 1920 all three factories were working, and the output of rings was over 60,000,000, the number of people employed being 520. The renewed importation of German mantles, however, had necessitated the closing of the two new factories, and the concentration of manufacture at Earlsfield, for the sake of economy. At the end of 1924 the workers employed there numbered 172. With the increased importation of German, Austrian, Italian, and Polish mantles in 1925, the output at the factory had been further reduced, and only 102 workers were now employed. There were only four manufacturers of these rings in the world, only one being in England. It was of the utmost importance to the British mantle manufacturers that the Earlsfield factory should be kept in operation, and that it should have a sufficient output to ensure its being able to compete on reasonable terms with the factories abroad. If output were reduced so that the Clay Ring Company could only sell at its present price at a loss, the British mantle manufacturers would either have to bear those losses, which would make them still less able to meet competition, or close the ring factory. In the latter case they would be entirely at the mercy of their German competitors for supplies of one of their essential raw materials, and one which, probably as much as thorium nitrate, was now a key to the mantle situation.

In February of this year, Mr. Garland had made inquiries as to the rates of wages paid in German mantle factories, and had obtained from three different sources figures which were substantially identical to those given by Mr. Talbot as the rates obtaining in Germany at that time. As to the reduction in the number of mantles consumed in this country now as compared with the period before the war, he attributed this to the change from the upright to the inverted type of mantle, and even more to the great improvement in quality of the inverted type.

Cross-examined, witness said that the price of mantle rings was not fixed by the mantle manufacturers; he fixed the price in relation to the cost of production.

Mr. *Edmund White* (Managing Director of Messrs. Hopkin & Williams (Travancore), Ltd., and of Messrs. Thorium, Ltd.) referred to the German control of the deposits of monazite sand (from which thorium nitrate was made) before the war, and said that when war broke out, thorium nitrate was not being commercially manufactured from monazite in this country. As soon as supplies were available, however, Messrs. Thorium, Ltd., commenced to produce thorium nitrate and cerium from monazite on a commercial basis. The manufacture of thorium in this country could not be safeguarded if gas mantles, which were virtually the only articles for which it was used, were allowed to come into this country with a duty calculated only upon the value of the thorium *qua* thorium contents of the mantle, and not upon the thorium in the form of gas mantles (including the cost of putting it in that form), or unless an effective duty were imposed upon the gas mantle itself. His was the only Company at present manufacturing thorium nitrate in this country. If demands for thorium nitrate from British gas mantle manufacturers were further curtailed by reason of foreign mantle competition, then either the price would have to be increased or the manufacture of thorium nitrate, and with it cerium and mesothorium, would cease, and again the country would have to look to foreign countries in times of peace and war for those essential materials the manufacture of which had been considered by all Governments as a key industry.

In cross-examination, witness said that 50 p.ct. of the capital of Thorium, Ltd., was owned by a gas mantle manufacturing company, and the remainder by other interests; but the price of thorium nitrate was not controlled by mantle manufacturers.

This concluded the evidence for the applicants.

Herr *Zeigler* was then re-called for cross-examination by Mr. Soper with regard to the rates of wages paid by his Company. Witness said that the rates paid to the mantle operatives were the same as those paid in the Company's chemical factory, but those rates were not paid in an electrical factory also owned by them. Witness could not say whether or not Mr. Soper was correct in suggesting that the wages paid in other mantle factories in Germany were only two-thirds of those paid by Herr Zeigler's company, or that the latter were the highest paid in any industry in Germany.

Mr. MACASKIE, summing up on behalf of the opponents, contended that the whole of the conditions laid down by the Board of Trade had to be satisfied by the applicants if they were to be successful, but that in only one particular had the applicants been able to satisfy those conditions. The industry was not of substantial importance from the point of view of the number of workers employed, or from the national point of view. In his comments in this connection, he said that from the standpoint of volume of employment the industry was miserably out of the picture. The real difficulty of the industry before the war, when there was a greater degree of competition than now, was not that the British industry could not cope with the demand, but that the supplies of monazite sand, from which thorium nitrate was obtained, were under foreign control. This did not apply now, however, and there was no reason to suppose that the industry would ever again be short of essential supplies. As to the suggestion that German mantles were being retained for consumption in this country in abnormal quantities, he met that by pointing out that before the war foreign manufacturers supplied 75 p.ct. of the home consumption of standard mantles, whereas in 1924 they had supplied only 36 p.ct. Also, 1920 should not be taken as a standard year in this connection, because foreign manufacturers had not had time to re-organize their competition then. In connection with this competition, Germany had not been breaking new ground, but was simply returning to a market which it had held up to 75 p.ct. of the consumption before the war. Commenting on the allegation that foreign mantles were being sold in this country at prices below which they could be profitably manufactured here, he said that, although costs of materials were about the same in this country and in Germany, and there was only a difference of 1d. per hour between the wages paid in the two countries, there was still an alarming difference in costs of production, and his suggested explanation was that the overhead charges of British manufacturers were too high. Overhead charges, however, did not enter into the inquiry, according to the Board of Trade instructions. Competition was not unfair, because conditions of employment in Germany were not inferior to those in this country, except to the extent of 1d. per hour in wages; but against this advantage, German manufacturers

had to meet freight and insurance charges when exporting to this country. Again, to show that competition did not seriously affect employment here, he pointed to the small number employed in the British industry.

Mr. SOPER, in his final remarks, stressed the national importance of the industry, for the reasons already given in his evidence. Gas was probably the predominant source of artificial lighting in this country; and the gas mantle was the key to modern gas lighting. It had enabled great economies to be effected in gas manufacture, because the use of the mantle had permitted valuable bye-products to be stripped from gas. He also laid emphasis upon the value of the gas mantle from the point of view of the conservation of the nation's coal resources. Mr. Soper examined the conditions laid down by the Board of Trade for the guidance of Committees, and, in claiming that these conditions had been fulfilled, added that a *prima facie* case had to be made out for a protective duty before the Board of Trade would appoint a Committee to inquire into it. The Board must have been satisfied that a *prima facie* case had been made out, or the present inquiry would not have been held. The year which he asked should be taken as a standard in arriving at a conclusion as to whether foreign gas mantles were being retained for consumption in this country in abnormal quantities was 1920, because that was the last year in which the industry was in a position to work economically and to sell at a reasonable profit. The balance-sheets of the companies concerned had shown that those companies had not paid a dividend since 1920. With regard to wages in Germany, he pointed out that when the British manufacturers had applied for a duty on German mantles under Part II. of the old Safeguarding of Industries Act, and when German witnesses came here to give evidence against the application, wages in Germany had shown an extraordinary rise. The same thing had happened in the present case. Less than three weeks ago there was again a rise in wages in one of the factories in Germany, which was due to Herr Zeigler's company having made themselves a party to an agreement to pay wages which were being paid in the chemical industry. Mr. Soper suggested that, in view of Herr Zeigler's admission that the retention of his share in the British market was a matter of vital importance to his Company, it might be a prudent action to agree to pay high wages, if, by doing so, the present application could be defeated. In his further remarks, Mr. Soper refuted the suggestion that overhead charges in this country were too high, and said his figures showed that efficiency in this country was higher than in Germany. Finally, he asked the Committee to recommend the imposition of a flat rate duty on imported mantles rather than an *ad valorem* duty, and said that he was satisfied that his suggested figure of 10s. per gross was not a penny too high; in fact, some of his colleagues considered it too low.

At the conclusion of the proceedings, the Chairman thanked the leaders and witnesses on both sides for the courteous manner in which they had put their cases and given evidence, and intimated that the Committee would consider its opinion at an early date.

The Committee's decision will be published in due course.

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

The gloomy market conditions continue unchanged, and there is nothing new to report. The policy of working short time rather than accepting business at still lower prices is becoming more and more necessary, as buyers' ideas seem to be that every order should be taken at a little less than the one before, irrespective of what the loss to the producers may be. More and more collieries are realizing the need for making a stand, but the decreased quantities available for sale still seem to be far more than enough to meet the demand.

It does not seem likely that there can be any change in the position while the present uncertainty prevails as to the future. Both buyers and sellers are disinclined to commit themselves until it can be seen what arrangement is likely to be arrived at with regard to wages.

In gas makes, Wear Specials continue to quote 18s. 6d. to 18s. 9d. f.o.b., and best qualities 18s. to 18s. 3d. These prices are nominal, and actual business is subject to negotiation. Seconds and others are 15s. 9d. to 16s. 3d. There is practically no demand for coking sorts, and 16s. to 16s. 3d. is the price of best makes.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

The condition of affairs in the coal trade in Yorkshire and Lancashire is gradually, but surely, assuming a very grave aspect. Many of the larger collieries are threatened with the immediate prospect of having a struggle to work even three days a week. The fate of the smaller pits with lower outputs and the increased cost of production is causing the greatest anxiety to those concerned.

House coal, which during normal times flows into the shipment areas, is held up on account of the higher rates of exchange and the keen competition from the nearer Continental producing centres; while the home market demands are, owing to climatic conditions, reduced to a minimum. The present indications of still further reduced prices even of the best industrial fuels are likely, however, to have some effect on the improvement from the larger manufacturing centres; and with coal and furnace coke reduced to present-day figures, there is some hope for the iron and steel trades.

Gas coal prices still vary, with indications that consumers are inclined more than ever to buy washed nuts and to leave screened and unscreened gas coal alone. Some collieries now stipulate that any expected offers should be in proportion for washed nuts and screened coal.

The unsettled state of the market rather inclines to the opinion that rock bottom has not been touched in respect to the figures likely to obtain for the remaining purchases of gas coal. Some of the contracts fixed months ahead of the earliest deliveries will be slightly above the average price.

There is no change in the shipping outlook, though prices have come to such a low level, showing a big loss to collieries, that it is apparent that the rates of exchange will have to operate much differently before business of any magnitude is possible.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

Drastic steps are being taken to bring the output of coal into correspondence with the shrinkage of demand. It is significant of the condition of stocks and the view taken as to the issue of the negotiations on which the working of the industry after this month so largely depends that collieries are reducing current production decisively. They can hardly do otherwise, for coal cannot be raised at anything like the prices at which some of the stocks are being liquidated. Most of the big gas undertakings have now completed contracts for the new trading year. Commitments are on a much smaller scale than twelve months ago. Apart from undelivered balances on the old contracts, industrial conditions do not dictate such a cautious policy as big consumers thought necessary when the perils of the railway strike were fresher in their memory. A number of municipally owned undertakings cannot square their accounts owing to the slump in residuals, and increased prices will have to be charged. At Birmingham the fall in the revenue from tar was nearly £70,000, in spite of increased production, and there was a drop of £21,644 on ammoniacal liquor. A reduction of 5s. has been made recently in the price of coke, representing a loss of income of £100,000 per annum. It is proposed to make increases in the scale of prices for gas varying from 3d. to 4d. per 1000 c.ft. forthwith.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *June* 15.

There are no particular changes to report in the London tar products market. There is a moderate amount of inquiry for pitch for next season's shipment, but buyers' ideas are below those of sellers.

There is a fair demand for creosote, but supplies are scarce for the next few months.

The demand for road tar is taking up current makes of both pitch and creosote.

Solvent naphtha is in request, and available supplies are readily absorbed. This is also the case with benzole and toluole.

Current values are as follows: Pitch, 41s. to 42s. per ton, nominal; creosote, 7d. per gallon in bulk at works; solvent naphtha, 1s. 8d. to 1s. 9d. per gallon 95/160 quality; pure benzole and pure toluole, 1s. 11d. to 2s. per gallon.

Tar Products in the Provinces.

June 15.

There is little alteration in the markets for tar products.

For pitch there has been a little more inquiry during the past week, and it is evident that some consumers would like to purchase for next season's delivery.

In creosote there has been a little inquiry, but no alteration in the price.

Benzole and solvent naphtha are in fair demand.

Crude carbolic and crystals are still neglected.

The average values for gas-works products during last week were: Gas-works coal-tar, 26s. to 31s. Pitch, East Coast, 39s. to 40s. f.o.b. West Coast—Manchester, 34s. to 35s.; Liverpool, 35s. to 36s.; Clyde, 38s. to 39s.; Benzole, 90 p.ct., North, 1s. 7½d. to 1s. 8¼d.; crude, 65 p.ct. at 110° C., 1s. to 1s. 1d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 7¼d. to 1s. 8¼d. Toluole, naked, North, 1s. 6¼d. to 1s. 7¼d. nominal. Coal-tar crude naphtha, in bulk, North, 7¼d. to 8¼d. Solvent naphtha, naked, North, 1s. 5d. to 1s. 6d. Heavy naphtha, North, 1s. to 1s. 2d. Creosote, in bulk, North, liquid, 5¾d. to 6d.; salty, 5¼d. to 5½d.; Scotland, 5¼d. to 5¾d. Heavy oils, in bulk, North, 6¼d. to 7d. Carbolic acid, 1s. 5d. to 1s. 6d. prompt. Naphthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

CONTRACTS OPEN.

Coal.

The Bakewell Urban District Council are inviting tenders for the supply of 2500 tons of gas coal. [See advert. on p. 974.]

Tenders are invited by the Gas Committee of the Carnarvon Corporation for the supply of about 3000 tons of gas coal. [See advert. on p. 974.]

Tar.

The Edinburgh Corporation Gas Department are inviting tenders for the purchase of their coal gas and carburetted water gas tar. [See advert. on p. 974.]

An order for the repair and modernization of the purifiers at the Fleetwood Gas-Works has been placed by the Directors with Messrs. R. & J. Dempster, of Manchester. This will assist in relieving unemployment.

STOCK MARKET REPORT.

ARISING out of the failure of the recent capital issues, it is reported that further Colonial Government issues are banned for the present. The demand for fresh industrial capital is, however, increasing, and proposals involving a total issue of nearly £14,000,000 may be expected shortly. The principal of these are: Dunlop Rubber Company, Ltd., £5,000,000 5½ p.ct. Debenture at 97½ p.ct.; Union Cold Storage Company, Ltd., £3,200,000 6 p.ct. Cumulative Preference Shares of £1 at par; and Synthetic Ammonia and Nitrate, Ltd., £2,000,000 Debentures. Some of the issues are to provide for further extension of trade, which is hopeful; but the last of the three issues mentioned will not, we imagine, appeal to investors in gas companies, as it appears to be a direct challenge to the sales of sulphate of ammonia.

During the past week there were frequent bouts of heavy selling of gilt-edged stocks by underwriters with commitments on the recent issues, and prices were mostly weaker. Railways continued to be depressed; the hopes of improved traffic receipts over the holidays not being realized. Industrials were good in parts. The heavy over-subscription of the Allied Northern Newspaper Debentures attracted attention to other similar issues. Tobaccos and Silks were, as usual, prominent. Rubbers were very active; and if the price of the commodity is any indication of prosperity, there should be some good results announced later. Oils are rather a mystery. A reduction in price in gas oil last week is followed by an announcement of an increase in crude oil on the other side of the water. The fact remains that the leading shares showed improvements on the week.

Gas stocks and shares were in demand. Although most of the changes in quotations were due to interest or dividend payments, there were a number of other variations. Plymouth and Stonehouse moved up 1 point, and Hongkong and China 1½ points. The falls, however, still predominate; Liverpool 5 p.ct. ordinary, South Suburban ordinary, and Tottenham "B" with a drop of 1 point each, and Imperial Continental a drop of 2 points, were the sufferers.

The following transactions were recorded during the week: On Monday, Brighton and Hove original 167, 169, Cape Town 7¼ *ex* div., Continental Union 7 p.ct. preference 90⅜, European 7, Gas Light and Coke 83¼, 83½, 83⅝, 84, 84¼, Imperial Continental 147, 147½ *ex* div., Montevideo 67½, Primitiva 9s. 7½d., 9s. 9d., 10s., 4 p.ct. debenture (1911) 65, 66, South Metropolitan 93½, 93⅞, 94, 94¼, 94½, Tottenham 5½ p.ct. preference 104⅜. Supplementary prices, Swindon 5 p.ct., 70, 70½.

On Tuesday, Bombay 4⅞, Cape Town 7, 7⅛ *ex* div., Commercial 4 p.ct. 86, Gas Light and Coke 83¼, 83½, 84, 84⅜, 4 p.ct. preference 70⅜, Imperial Continental 146, 146⅝, 147, 149, 3½ p.ct. debenture 72½, 73, Liverpool 7 p.ct. preference 104⅝, Primitiva 9s. 9d., 10s., 4 p.ct. debenture (1911) 65¼, South Metropolitan 93¼, 93½, 93⅝, 93⅞, 6½ p.ct. debenture 103¾, 103⅞, Tottenham 5½ p.ct. preference 104, 104¼, 104½. Supplementary prices, Sunderland 6 p.ct. maximum 102¼, 102⅜, Worthing Coke consolidated 93, 93⅜.

On Wednesday, European 6⅜, 7, Gas Light and Coke 83¼, 83⅜, 84, 3½ p.ct. maximum 62, 4 p.ct. preference 79, 79¼, 3 p.ct. debenture 60⅜, Imperial Continental 146, 147 *ex* div., Primitiva 9s. 6d., 9s. 7½d., 9s. 9d., South Metropolitan 93¼, 3 p.ct. debenture 60⅜, South Suburban 5 p.ct. 95, Tottenham 4 p.ct. debenture 77.

On Thursday, Bombay 5⅛, Brentford 4 p.ct. debenture 79 *ex* div., British 7 p.ct. preference 124, 124⅛, Cape Town 4½ p.ct. 1st mortgage debenture 73½, 74, European 7⅜, Gas Light and Coke 83⅛, 83⅜, 84, 4 p.ct. preference 79, 79½, 3 p.ct. debenture 59½ *ex* div., Hastings and St. Leonards 3½ p.ct. converted 76½, Imperial Continental 146, 147, Oriental 104⅛, Primitiva 9s. 3d., 9s. 6d., South Metropolitan 93½, 93⅜, South Suburban 5 p.ct. 94⅜, Southampton 5 p.ct. maximum 81½, 82, Tottenham 4 p.ct. debenture 77, 77⅛, 78, 78⅛, Wandsworth "B" 111. Supplementary prices, Hartlepool 5 p.ct. maximum 91, St. Albans consolidated 101, 101½.

Brighton and Hove 168½, "A" 124½, Croydon 100, European 7, 7½, Gas Light and Coke 83⅛, 84, 4 p.ct. preference 79½, 79⅜, Imperial Continental 146, 147½, Primitiva 9s., South Metropolitan 93¼, 93⅜, 94, 94⅛, 6½ p.ct. debenture 103⅜, Tottenham 5½ p.ct. preference 104½, 104⅝, Wandsworth "A" 130, "B" 110½. Supplementary prices, Shanklin 5 p.ct. consolidated 100, 100½, Walton-on-Thames and Weybridge 7 p.ct. "B" 10⅜.

At the close of the week monetary conditions in Lombard Street were easier. Renewals of day-to-day advances were arranged on the lower basis of 3½ p.ct. Business in the discount market was on the small scale; and although the Treasury Bill rate was slightly higher—£4 7s. 10·41d. p.ct.—there was little effect on the open market quotations.

On the Foreign Exchange Market both francs and lire were offered freely, and the rates of these exchanges depreciated further. French francs closed at 100.22½, Belgian francs at 102.10, and Italian lire at 122.95. Sterling on New York was quiet, and the rate closed slightly lower at 4.85 27/32.

Silver closed at 31⅜d. per oz., and gold was unaltered at 84s. 11½d.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on March 5. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3¼ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.-Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. June 12.	Rise + or Fall − on Week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
177,978	Stk.	Feb. 5	5	5	Aldershot 5 p.c. max. C. .	78–81	..	..
295,492	,,	,,	4	4	Do. 4 p.c. Pref. . .	71–76	..	..
1,551,868	,,	Apl. 2	6¼	6¼	Alliance & Dublin Ord. .	65–70	..	..
374,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb. . .	63–68	..	..
300,000	5	May 7	8	8	Bombay, Ltd.	4⅛–5⅛	..	4⅛–5⅛
370,000	10	Mar. 5	8⅛	8⅛	Bournemouth 5 p.c. . .	12–13	..	..
425,050	10	,,	7	7	Do. B 7 p.c.. .	12⅛–12⅝	..	..
150,000	10	,,	6	6	Do. Pref. 6 p.c..	11–12	..	..
50,000	Stk.	Jan. 8	3	3	Do. 3 p.c. Deb..	56–59	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb..	78–81	..	..
992,045	,,	Mar. 5	6⅛	6⅛	Brentford A Con. . . .	95–100	..	..
900,500	,,	,,	6½	6½	Do. B New . . .	95–100	..	..
76,000	,,	,,	5	5	Do. 5 p.c. Pref. . .	95–98	..	..
306,690	,,	June 11	4	4	Do. 4 p.c. Deb. . .	75–80*	–1	79
181,337	,,	,,	6	6	Do. 6 p.c. Rich. Red. Deb.	100–105*	..	..
214,740	,,	Mar. 5	12½	12½	Brighton & Hove Orig. .	165–170	..	167–169
244,200	,,	,,	8½	9½	Do. A Ord. .	122–125	..	124½
1,287,500	,,	Feb. 19	5	5	Bristol 5 p.c. max. . .	96½–97½*a*	..	..
855,000	,,	Mar. 19	8	7	British Ord.	110–115	..	..
100,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref.. .	123–128	..	124–124½
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. .	72–77	..	..
100,000	10	May 21	6	8	Cape Town, Ltd. . . .	6¾–7¼	..	7–7⅛
100,000	10	Apl. 23	4½	4½	Do. 4½ p.c. Pref.. .	6–7	..	..
150,000	Stk.	Dec. 18	4½	4½	Do. 4½ p.c. Deb.. .	71–76	..	73½–74
626,860	,,	Feb. 19	6	6	Cardiff Con. Ord. . . .	101–104	..	..
237,860	,,	Jan. 8	7¼	7¼	Do. 7¼ p.c. Red. Deb. .	104–107	..	..
157,150	,,	Feb. 19	5	6¾	Chester 5 p.c. Ord. . . .	89½–94½*b*	..	..
1,513,280	,,	Mar. 5	6	5/14/8	Commercial 4 p.c. Cap. .	86–89	..	86
560,000	,,	,,	6	5⅜	Do. 3½ p.c. Cap. .	86–89	..	..
475,000	,,	June 11	3	3	Do. 3 p.c. Deb. .	56–59*	–1	..
800,000	,,	14 Jan. 15	—	—	Continental Union, Ltd. .	35–40	..	..
200,000	,,	June 11	7	7	Do. 7 p.c. Pref. .	87–89*	–3	90⅛
660,000	,,	Mar. 5	6¼	6¼	Croydon sliding scale . .	98–102	..	100
284,975	,,	,,	5	5	Do. max. div. . . .	83–86	..	..
492,270	,,	Feb. 19	6	9	Derby Con.	110–112*c*	..	..
55,000	,,	Jan. 8	4	4	Do. Deb.	74–76*c*	..	..
1,002,180	I	Jan. 22	6	4	European, Ltd.	6⅞–7⅛	+⅛	6⅞–7⅛
16,460,970	Stk.	Feb. 19	5⅜	5⅜	Gas Light & Coke 7 p.c. Ord.	82–85	..	83½–84¾
2,600,000	,,	,,	3⅛	3⅛	Do. 3½ p.c. max. .	62–65	..	62
4,062,235	,,	,,	4	4	Do. 4 p.c. Con. Pref.	78–80	..	79–79⅜
4,761,930	,,	June 11	3	3	Do. 3 p.c. Con. Deb.	58–61*	–1	59½–60⅜
130,000	,,	—	10	10	Do. 10 p.c. Bonds . . .	..	..	..
42,000	,,	,,	7¼	7¼	Do. 7¼ p.c. Red. Deb. .	..	..	..
82,500	,,	Mar. 19	6⅜	6⅜	Hastings & St. L. 5 p.c. Conv.	92–97	..	..
258,740	,,	,,	5⅛	5⅛	Do. 3½ p.c. Conv. .	73–78	..	76½
70,000	10	May 7	10	10	Hongkong & China, Ltd. .	17–18	+1½	..
86,600	Stk.	Mar. 5	10	10	Hornsey 7 p.c.	136–141	..	..
1,976,300	,,	Mar. 31	10	50	Imperial Continental Cap. .	145–150	–2	146–149
263,950	,,	Feb. 5	3⅛	3⅛	Do. 3½ p.c. Deb. .	71–74	..	72½–73
235,242	,,	Mar. 19	6⅛	6⅛	Lea Bridge 5 p.c. Ord.. .	96–101	..	..
8,127,340	,,	Feb. 19	5⅛	5⅛	Liverpool 5 p.c. Ord. . .	87½–88½*b*	–1	..
600,000	,,	Mar. 19	7	7	Do. 7 p.c. Red. Pref.	103½–104½*b*	..	104⅛
165,736	,,	Feb. 19	9	8	Maidstone 5 p.c. Cap. . .	122–132	..	..
63,480	,,	Dec. 18	3	3	Do. 3 p.c. Deb.. . .	53–58	..	..
75,000	5	Dec. 4	7	5	Malta & Mediterranean .	4⅛–4⅜	..	..
541,920	Stk.	June 11	4	4	Montevideo, Ltd. . . .	64–68*	–2	67½
2,061,315	,,	Mar. 5	5	5	Newcastle & Gateshead Con.	75–77*d*	..	..
300,929	,,	,,	4	4	Do. 4 p.c. Pref.. .	76–77*d*	..	..
529,705	,,	Dec. 18	3⅛	3⅛	Do. 3⅛ p.c. Deb.	68⅛–69⅛*d*	..	..
15,000	,,	Mar. 5	11	12	North Middlesex 10 p.c. .	..	..	..
75,940	,,	,,	7 10/0	8⅜	Do. 7 p.c. . . .	..	..	..
900,000	Stk.	May 7	9	7	Oriental, Ltd.	100–105	..	104⅛
188,120	,,	Jan. 8	7⅛	7⅛	Plym'th & Ston'house 5 p.c.	110–115	+1	..
60,000	50	Mar. 5	13	14	Portsea Island B . . .	96–99	..	..
100,000	50	,,	12	13	Do. C	93–98	..	..
2,289,909	1	,,	—	—	Primitiva Ord.	9/0–10/0	–/6	9/0–10/0
311,100	100	June 2	4	4	Do. 4 p.c. Red. Deb.. .	78–80	..	..
600,000	Stk.	Jan. 22	4	4	Do. 4 p.c. Red. Deb. 1911	64–66	..	65–66
220,335	,,	Dec. 18	4	4	Do. B. Aires 4 p.c. Rd. Db.	65–67	..	..
321,670	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	65–67	..	..
150,000	10	Mar. 19	6	6	San Paulo 6 p.c. Pref. . .	7–8⅛	..	..
125,000	50	Jan. 2	5	5	Do. 5 p.c. Red. Deb.	43–46	..	..
270,000	Stk.	Mar. 19	5⅛	5⅛	Sheffield A	103–105*e*	..	..
419,968	,,	,,	5⅛	5⅛	Do. B	103–105*e*	..	..
1,047,000	,,	,,	5⅛	5⅛	Do. C	103–105*e*	..	..
90,000	10	June 11	6	4	South African	7–9*	..	..
6,669,895	Stk.	Feb 19	5	6¼	South Met. Ord.	93–95	..	93¾–94⅛
1,895,445	,,	Jan. 8	3	3	Do. 3 p.c. Deb. . .	59–62	..	60⅜
734,000	,,	Mar. 5	6⅜	6⅜	Do. 6½ p.c. Red.Deb.	102½–104½	..	103¼–103⅞
91,500	,,	Mar. 5	8⅛	8⅛	South Shields Con. . . .	135–136*d*	..	..
1,187,795	,,	Feb. 19	6¼	6¼	South Suburban 5 p.c. .	94–97	–1	94⅛–95
368,837	,,	Dec. 18	5	5	Do. 5 p.c. Deb.	100–100	..	..
647,740	,,	May 7	5	5	South'mpt'n Ord. 5 p.c. max.	80–83	..	81½–82
121,375	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	72–77	..	..
250,000	,,	Mar. 5	7	7	Swansea 7 p.c. Red. Pref. .	102–104	..	..
200,000	,,	Dec. 18	6¼	6¼	Do. 6½ p.c. Red. Deb. .	103–105	..	..
120,000	,,	Feb. 19	8	8	Tottenham District A 5 p.c.	116–119	..	..
882,275	,,	,,	6½	6½	Do. B 3½ p.c.	93–98	–1	..
150,000	,,	—	—	—	Do. 5½ p.c. Pref.	103–105	..	104–104⅜
181,253	,,	June 11	4	4	Do. 4 p.c. Deb.	76–79*	–1	77–78⅛
258,251	,,	Mar. 19	5	5	Tynemouth Con. and New	74–76*d*	..	..
					Uxbridge, Maidenhead, &			
197,294	,,	Feb. 19	6⅞	6⅞	Wycombe 5 p.c. . .	95–100	..	..
88,330	,,	,,	5	5	Do. 5 p.c. pref. . .	95–100	..	..
92,800	,,	,,	—	6⅛	Do. 5 p.c. Maidenh'd	90–95	..	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Mar. 5	9⅛	9⅛	Wandsworth A 5 p.c. .	130–135	..	130
255,636	,,	,,	7⅛	7⅛	Do. B 3½ p.c.t. .	110–115	..	110½–111
392,955	,,	,,	6/9/6	6/9/6	Do. C and New	95–100	..	..
352,000	,,	,,	7⅛	7⅛	Wimbledon 5 p.c.t. . .	105–110	..	..
98,000	,,	,,	7⅛	7⅛	Epsom 5 p.c.t.. . . .	112–117	..	..
88,416	,,	Dec. 18	3	3	3 p.c. Deb.	57–60	..	..

Quotations at :—*a*,—Bristol, *b*,—Liverpool, *c*—Nottingham, *d*,—Newcastle, *e*,—Sheffield. * Ex. div.

Premier Gas Mantles, Ltd., is the title of a Company registered recently, with a capital of £7000 in 4s. ordinary and 1s. deferred shares.

Results at Carlisle.—The annual report of the Carlisle Corporation Gas Committee states that the net profit was £2080. The number of cookers out on March 31 this year was 6309, compared with 5455 on the same date last year—an increase of 854. There has been a marked decline in the prices obtainable over the year for tar, which shows a fall of about 50 p.ct. During nine months of the year under review gas has been sold at 6d. per 1000 c.ft. less than the preceding year; the present price being 3s. 6d. per 1000 c.ft. The extension of the mains to Carleton, Dalston, Burgh-by-Sands, and Kirkandrews has now been completed. The number of additional consumers obtained thereby is very satisfactory.

Manchester Gas Accounts.—The Finance Committee of the Manchester Corporation report, in regard to the gas undertaking, that the approximate account for the past year shows that the result of the working was worse than was anticipated by £5793. The estimates provided for a deficiency of £60,801; actually the figure was £66,594. This difference is occasioned by smaller income than was estimated from the sale of tar and sulphate of ammonia, although the income from sales of gas, hire of fires, &c., and sales of coke is in excess of the estimate. The estimates for the current year provide for a deficiency of £78,929, and in addition it is proposed to meet capital expenditure out of revenue to the extent of £20,000, so that the total amount involved is £98,929. At March 31 next, the accumulated surplus of £32,172 will have been appropriated; and a deficiency of £66,757 will have to be carried forward to be liquidated out of future profits or by increasing the price of gas. The Finance Committee are in conference with the Gas Committee on the matter.

The price of gas at Blairgowrie has been reduced by 6d. per 1000 c.ft., making it 6s. 9d., less 5 p.ct.

Mr. Alan Dawson, a popular member of the clerical staff of the Exeter Gas Company, was drowned while holiday-making near Whitchurch (Salop) last week. He was 22 years of age.

The Burnley Gas Committee, having had a list of employees in the department who were over 60 years of age, have been considering a scheme for the pensioning of aged employees; but for the present further consideration is postponed.

The Lytham St. Annes Gas Department announce that, from April 1 last, the charge for gas to ordinary consumers is 4s. 4½d. per 1000 c.ft., less 4½d. discount, or 4s. per 1000 c.ft. net. Recently the Corporation gave notice of their intention to supply gas of a calorific value of not less than 525 B.Th.U. throughout the borough, in substitution for the present supply of 500 B.Th.U. in the St. Annes area and 430 B.Th.U. in the Lytham area.

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JOHN S. BROWN,
Engineer and Manager.
Gas and Water Offices,
Gas-Works,
New Mills, near Stockport,
June 13, 1925.

WANTED.—Bricklayers used to Retort Setting, particularly Vertical Retorts. Can start immediately. Standard rates and out money.
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Condensers.—Water cooled, 500,000 c.ft. per day. Four Annulars, 36 in. by 18 in. by 16 ft.; 6 in. by 8 in. Pipe Condensers. Also Patent Baffle Plate Condensers.
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Tower Scrubbers.—10 by 70, 4½ by 36, 4½ by 18.
Exhausters.—2000 to 50,000 c.ft. per hour capac.
Station Meters.—3000, 5000, 8000, and 15,000. Also 100 lt. and 200 lt. Meters.
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TENDERS are invited for the Supply of GAS COAL, 2500 Tons, for One Year, delivered at Bakewell Station, L.M. & S. Railway.
Forms of Tender and Particulars can be obtained from the undersigned, to whom Tenders must be sent by June 27.

V. R. COCKERTON,
Clerk to the Council.
Bakewell,
June 12, 1925.

EDINBURGH CORPORATION.
(GAS DEPARTMENT.)
TENDERS FOR TAR.

THE Magistrates and Council are prepared to consider TENDERS for the Purchase of their Coal Gas and Carburetted Water Gas TAR over a period of One, Two, or Three Years at their Option, Delivery of the Tar to be taken in Tank Wagons as produced.
Full Particulars may be obtained from Mr. H. H. Gracie, Engineer and Manager, 15, Calton Hill, Edinburgh.
Sealed Tenders, endorsed "Tender for Gas Tar," to be addressed to the Undersigned on or before Monday, June 22, 1925.
The Magistrates and Council do not bind themselves to accept the lowest or any Offer.

ANDREW GRIERSON, S.S.C.,
Town Clerk.
City Chambers,
Edinburgh,
June 13, 1925.

TENDERS FOR GAS COAL.

THE Gas Committee of the Carnarvon Corporation invite TENDERS for the Supply of 3000 Tons of Best Screened GAS COAL, more or less, to be delivered free as required, in Trucks on the Gas-Works Siding, Carnarvon, during the Twelve Months ending the 1st of July, 1926.
Sealed Tenders, endorsed "Tender for Coal," and addressed to the Chairman of the Gas Committee, Guildhall, Carnarvon, to be Delivered on or before Thursday, June 25.
The Committee reserve to themselves the right to divide the quantity into two or more Contracts, and do not bind themselves to accept the lowest or any Tender.
There is a haulage rate of 5d. per ton from Station to Gas-Works Siding, this to be included in the price quoted per ton.
No special form of Tender issued.

WILLIAM M. RUNTON,
Manager.
Gas Office, Carnarvon,
June 15, 1925.

COMPANY NOTICES.

SOUTH SUBURBAN GAS COMPANY.

NOTICE is Hereby Given that the TRANSFER BOOKS relating to the 5 per cent. Ordinary Stock of this Company WILL BE CLOSED from the 1st to the 28th July proximo, both days inclusive.

By order of the Board.
WILFRID WASTELL,
Secretary.
Head Offices:
Lower Sydenham, S.E. 26.
May 30, 1925.

STOCK ISSUES.

By Order of the Directors.
NEW ISSUE OF CAPITAL.
WOLVERHAMPTON GAS COMPANY.
The Directors OFFER FOR SALE BY TENDER not exceeding
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SIX PER CENT. PREFERENCE STOCK
(Irredeemable).
Minimum Price of Issue, Par.

The Profits of the Company for the Year 1924 were £31,564, and after payment of Interest on the Loan Capital the amount available was sufficient to cover the dividend on the Preference Stock (including the present Issue) more than four times.
Prospectus and Form of Tender (which latter must be received by 11 a.m. on Monday, June 29, 1925) may be obtained from the undersigned.

A. G. WILLIAMS,
Secretary.
Gas Offices,
Darlington Street,
Wolverhampton.

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1 30 ft. by 8 ft. 6 ins. by 120 lbs.		6026
1 30 ft. by 8 ft. 3 ins. by 120 lbs.		6163
2 30 ft. by 8 ft. 3 ins. by 100 lbs.		5630/81
4 28 ft. by 7 ft. 6 ins. by 120 lbs.		5791 & 5782/4
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GAS JOURNAL

LIGHT ✂ HEAT ✂ POWER ✂ BYE-PRODUCTS

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Telephone: Central 6055. —— Telegrams: "GASKING, FLEET, LONDON."

VOL. CLXX., No. 3241.] WEDNESDAY, JUNE 24, 1925. [77TH YEAR.

EDITORIAL NOTES.

Continuous Gas Sampling for Calorific Value Testing.

UNDER the Gas Regulation Act, the Gas Referees have large and highly responsible powers of prescription in respect of gas undertakings working under section 1, in order to assure the supply of gas in accordance with obligations. They can prescribe the places and times at which, and the apparatus and the method by which, tests —whether continuous or intermittent—shall be made. One limitation is that the prescribed apparatus "shall, in the case of any undertakers who have sold in the preceding years more than 100 million c.ft. of gas, and in any other case in which it appears necessary to the Gas Referees, include a calorimeter for the production of a continuous record of the calorific value of the gas which is being supplied." Thus it is seen that all undertakings making below 100 million c.ft. a year may be subjected to ordinary spot tests. This is an undoubted disadvantage to the small gas undertaking; and it was one of the main considerations in the communication which Prof. C. V. Boys, F.R.S., one of the Gas Referees, made to the meeting of the Institution of Gas Engineers. The work that he described is further evidence of the depth of interest the Gas Referees take in the operations of the gas industry within their province, and within the limits of their powers under the Gas Regulation Act. There has been evidence of this before—a desire to be practically constructive and advisory, in addition to exercising the functions relating to prescription. By the way, the prescription of a standard recording calorimeter has not yet been made. The wisdom of the delay is well recognized; but we should not be surprised to hear at any time now that the step can be taken with confidence.

It was not, however, the recording calorimeter that was the subject of the paper by Prof. Boys. It was directed entirely to the requirements of small works. In this regard, there are two matters which have impressed themselves upon the Referees. The first is that, in carrying out their duties, they have been much "oppressed" (we have not observed this, but Prof. Boys says so, and therefore it must be true) by the cost and the elaborate procedure which have grown up round the ordinary water-flow calorimeters, and which make their provision a serious burden in the case of small country places. This, it is said, applies less to the equipment within the testing-place than to the time required by the gas examiner, and the tedious nature of the operation which he has to conduct. To overcome this has not been such a serious matter as is another; and in respect of which up to the present the Referees have not found a solution which can be considered altogether satisfactory. The difficulty is this—to find a value for the average calorific value of the gas supplied when financial considerations unduly limit the number of tests. As Prof. Boys points out, if the number of tests is low, obviously there is a risk that the gas from a small works—of necessity more variable in quality than that to which most of us are accustomed—may be, on the very few occasions of test, caught at an unhappy moment when it is in a state of depression. Tests made at such times and unbalanced by tests made at more favourable times may give an unfair value for the average than has been actually delivered. This condition therefore involves the small undertaking in the constant provision of gas which is of higher value than that declared, in order that it may be safe from an adverse report. This is unjust in comparison with the large undertaking which can work (as experience testifies) very closely to the declared value. What the Referees are aiming at, to the advantage of the small works, is to attempt to introduce continuous automatic sampling of the gas for intermittent testing, so that the small works may have credit for the actual average value of the gas delivered. The idea is not a new one. It has been suggested before in connection with continuous gas sampling apparatus which has been on the market, but which is not admittedly under the similar controlling devices to which Prof. Boys subjects the design upon which he is working for the purpose of official tests of average calorific value in the small works.

How Prof. Boys has worked to reduce the triple burden —on the Gas Examiner, on expenditure, and on the small gas undertaking in regard to the security excess of calorific value—is explained in the paper. He presents and describes a complete equipment, consisting of a "Box" calorimeter, the Boys "Bell" meter, and the continuous sampling holder, with all the accessories. The constructional features do not call for reference here. Suffice it to say that simplicity and ingenuity characterize the complete equipment with the view of realizing the objective of bestowing upon the small undertaking something which will justly meet the needs, and comply with the Gas Regulation Act. Regarding the "Box" calorimeter, it is interesting to note that the water can be used over and over again. The advantages of this will be realized at once. Suitability and constancy of quality of water are requisites; and therefore the plan for re-use removes the anxiety as to doubtful quality, and ensures that the water has the same temperature as the room in which it remains and the air used for combustion. The water circulation is similar to that in the Boys recording calorimeter; and compressed cork is the insulating material. The manner in which Prof. Boys has overcome the radiation difficulty will appeal to those who have made a study of the structural features of calorimeters. From the full description given in the paper of the instrument and its operation, it does appear that the work of the gas examiner will be much curtailed and simplified, and this is what is required in a small works. As to the Boys "Bell" meter, here again a complete study has been made to provide for convenience and certainty. The meter problem in connection with calorimetry has always been a difficulty, and recurring faults have developed; but now (we hope this is well founded) Prof. Boys believes the whole of the troubles were eliminated by him in the meter he designed for the recording calorimeter. Most of the features (there is only one exception) have been incorporated in the "Bell" meter as adopted for independent use. The ease with which the water level can be ascertained and maintained is attractive. In short, even if there were no other grounds of indebtedness, Prof. Boys would have to be heartily congratulated upon the work he has done in this respect alone. From the knowledge of the meter and its working, he claims for it accuracy, convenience, and permanence over the usual form of meter. There is one

precaution which has to be taken. Where the meter is left in a room which falls in temperature, the glass cools more than the water; and this has the effect of completely obscuring the view, and makes observation impossible. Where this occurs, a protecting case should be used.

With regard to the testing of a continuously drawn sample of gas to obtain the average value between one testing and another, this is only at present put forward as a possibility which the Gas Referees could adopt, if found satisfactory, but not otherwise. It will be a considerable advantage if this can be done; and then we should feel that, in the complete equipment, the small works would have a reliable method of having justice done to its gas, and one which would relieve the examiner, and enable him to get through more work—especially when, as is the case in some of the smaller works, the same examiner is engaged by a group of local authorities. A complete test can be made with the "Box" calorimeter in 25 minutes; the gas being burned at the rate of 1 c.ft. per hour. This indicates that in connection with the continuous sampling of the gas, a very small holder will suffice. Another important thing is that for the small works a minimum of cost will be involved by this interesting and ingenious equipment. At the Institution meeting, the appreciation by the gas profession of the work of Prof. Boys found expression in a manner which must have assured him of its perfect genuineness.

Complete Defeat of the Chemical Manufacturers.

The gas industry appears to have to be perpetually on the defensive in respect of their rights, and this not only in regard to the preferential treatment by the Government of their chief competitor—electricity—but in connection with their secondary products. It should be the duty of the Government to see that a statutory industry serving the public, under adequate safeguards for the latter, should be allowed, by the utilization of its own resources, to function with the view of rendering public service with the utmost efficiency and economy. There has latterly been frequent discussion of the position in regard to electricity. To-day consideration must be given—and this can be done with great satisfaction—to the attitude of the chemical manufacturers to our industry. For years the chemical manufacturers have fought with the view of circumscribing the gas industry in its dealings with secondary products. Up to a point they succeeded, by securing (not through the general inquiry that was held) the one-third purchase restriction. That curtailment of power, although at present it has had no real mischievous effect, has always been highly objectionable, because it is a barrier to one of the industry's outlets for possible development in the quest for economies in the interests of the primary commodity and public service. Whatever can be done in the present or the future—perhaps by combined working—ought to be permitted if it is to public advantage. The chemical manufacturers have been making a fresh essay to curb gas undertakings by attacking the Gas Light and Coke Company with a persistency through the Law Courts which, in itself, was sufficient evidence that they meant to succeed in this new effort if argument and money expended on legal costs could win. *Deuchar v. The Gas Light and Coke Company* is how the case will in future be known; but no secret has been made of the fact that Mr. Deuchar was merely representative of a group of chemical manufacturers. When they started on this adventure, it was a big speculation; but they would not have pursued it from the first Court through the Court of Appeal to the House of Lords, had they not had visions of success. But every Court has been against them; the decisions have been unanimous from first to last. Not only so, but the Lord Chancellor (Viscount Cave) and Lords Dunedin, Atkinson, Sumner, and Buckmaster were also unanimous, and were so on the arguments alone of Counsel for the appellant. It is rarely that there is such complete unanimity. Naturally, the chemical manufacturers will not be satisfied with the result; but they must admit that their defeat was complete, and that their interpretation of the powers of the Gas Light and Coke Company was wholly unwarranted and wrong. It has been a costly matter for the chemical manufacturers to prove their error, and that the Company were not acting in contravention of their statutory authorization. We congratulate the Company, and at the same time recognize that the result has not only individual importance, but is of great value to the whole gas industry.

The argument before the Lords of Appeal and the judgments were reported in our last issue [p. 967]. The chemical manufacturers through Mr. Deuchar sought an injunction to restrain the Company from manufacturing caustic soda which they require in the conversion of naphthalene into beta-naphthol. It can readily be seen that, if the application for an injunction had succeeded, the Company would have been compelled to purchase their caustic soda from the chemical manufacturers, and the decision would have been available for application in many other directions—not only by the chemical manufacturers, but by other branches of trading. For example, what would have prevented an electricity supply undertaking applying for an injunction to restrain a gas undertaking from producing its own electrical energy for operating its machinery? If there is efficiency and economy (and so public advantage) in a gas undertaking producing any chemical or anything else for the purpose of its own business as compared with purchase from an outside source, why in the name of common sense should there be restraint? It is easy to see that a big principle was at stake in this case, and one which would have had far-reaching detrimental effects had it gone against the Company. Their Lordships, as the arguments show, fully recognized this. It was all a question of the interpretation of the powers under which the Company operate; and their Lordships agreed that Parliament, in giving the powers to work up secondary products, intended that they should do so in the most efficient and economical manner possible. To hold otherwise would be a distinct obstruction to progress and development. In this connection, the Lord Chancellor quoted, from the case of the *Attorney-General v. The Great Eastern Railway Company*, the view of Lord Selborne: "I agree with Lord "Justice James that the doctrine of *ultra vires* ought to be "reasonably, and not unreasonably, understood and ap-"plied, and that whatever may fairly be regarded as inci-"dental to, or consequential upon, those things which the "Legislature has authorized ought not (unless expressly "prohibited) to be held, by judicial construction, to be *ultra "vires*." Their Lordships agreed that the manufacture of caustic soda was incidental to the conversion of naphthalene into beta-naphthol. As to the manufacture of caustic soda by the electrolytic process producing chlorine, and that with caustic soda and chlorine one can make an enormous number of saleable combinations, the Lord Chancellor said the chlorine was a necessary bye-product in the process of making caustic soda, and he regarded it as a small matter. After this complete defeat, perhaps the chemical manufacturers will devote themselves to their own immediate businesses which they are allowed to develop in those ways which will produce the highest efficiency and economy, and leave the gas industry to do the same. The fact that gas undertakings are statutory concerns, while chemical manufacturers are free, should not place upon the former restraints which would be disadvantageous to them and directly advantageous to the latter.

Centenary of Benzene Discovery.

The benefit which the discovery of benzene by Michael Faraday conferred upon the world defies measurement. Words to that effect were used by Lord Balfour at the wonderful centenary celebrations of the discovery held in London last week, when the primates of the scientific world assembled to do honour to one who was a prince in science. The words are true. The discovery has had world-wide effects—in the building of industries, in creating employment, in beautifying life, in increasing the scope of art, in assisting in providing for transport on land and in the air, and in another direction of which much was heard during the terrible four-and-a-half years which succeeded Aug. 4, 1914. Faraday little knew the place his discovery would take in the world's affairs and activities in peace times and in the disturbed periods of war. As Dr. H. E. Armstrong so aptly put it last week, the discovery has proved one of the most fundamental of chemistry. It was only fitting that the gas industry should have had representatives taking part in the celebrations; for it has done much, and is doing it daily, in releasing from coal the elements from which benzene is derived. The work in this

connection of the carbonization industries and of the Benzol Association was referred to by Dr. Armstrong; and among those who heard there are few who know of the magnitude of that work better than Mr. D. Milne Watson, Mr. E. V. Evans, Sir Dugald Clerk, and several of the scientific men—such as Professors Bone, Frankland, and Perkin—whose names are linked in one way or another with the gas industry.

The speeches that were made at the celebrations by the Duke of Northumberland, Lord Balfour, and many distinguished scientists, constitute a perfect gold mine in lessons for the individual and the nation. A new discovery may appear at first blush to be a small thing. Its real value to the world can only be tested and proved by time. A discovery is a germ; it may be one that will have prolific growth, but not till the growth is an accomplished fact can we estimate its true worth. A hundred years away from this discovery, we can look back upon the developed inestimable utilities of benzene; Faraday himself, intellectually brilliant and far-seeing as he was, could not penetrate the hundred years that were to succeed the discovery. He could not have precognition of the further discovery by William Henry Perkin of the aniline colours, the first of which was mauve. Nor could he foresee that his discovery succeeded by that of Perkin would so vastly enrich—not this country, but Germany, through the profound inappreciation by the Government in power when this great contribution was made to the riches of the world. So, however, it was; but that particular lesson from the history of benzene should cause the Government of to-day to give good heed to the products of science in the interests of the nation. Discoveries which indicate the possibility of new industry or the development of existing industry are more worthy of Government encouragement than many other things upon which they set their minds, put their hands, and spend money from the Exchequer. Lost industries are difficult to restore; in this regard no lesson of greater acuteness presents itself than the dye industry, and all it has involved in attempting to establish it on a firm basis in this country. British discovery through research or inventive genius must not again be permitted to pass hence for the foundation of industry in a foreign country to the detriment of this one.

The Duke of Northumberland, at the celebrations, said one of the most distressing features of the times is the failure to link-up scientific discovery and methods with public service. Thankfully we discern a change in this condition, through the Department of Scientific and Industrial Research, the National Physical Laboratory, and the Board of Fuel Research, with Government grants to research in other directions. We are as a nation safeguarding ourselves. But even now it cannot be said that all is being done that should be done. There are complaints that, while there is recognition of a great need for research and of applying its fruits, there is all too little regard for its sufficient support; and big results and parsimony have never gone well together. Before us is spread another lesson in the depressed state of industries and the mass of unemployment, the dimensions of which sometimes give signs of diminishing, and then a reaction sets in, until now unemployment is again working towards a fresh peak in the curve. To help to diminish the severity of movements in industrial activity and in the volume of employment, the foundations and structure of industry require to be developed by greater application to our scientific and research resources. It is a matter of good Government to look well and generously to these factors; and the degree of future national prosperity rests very much upon the measure of which is done in this direction. There are, however, things that appear to be lacking in our scientific and research work to-day; and they are system, co-ordination, and definite objectives. In our research work for the solution of problems and the making of discovery for which the nation pays, we seem to jump from one thing to another with surprising alacrity, and hear comparatively little of the objectives and their realization. There is much work that should be done, and must be done initially, to set in order scientific research with the view of bringing to the country the maximum material results. These may not be immediately attainable; but scientific research carried out for the nation, and financed by it, should be placed in a position impregnable to genuinely adverse criticism.

To return to the celebrations of the centenary of the discovery of benzene, much was said as to the life of Faraday. It was a life devoted to science—science directed to practical ends which have been incalculably beneficial to mankind. Faraday was a modest and devout worker; but the brilliance of his accomplishments made him one of the great luminaries of the scientific world. He could not, however much he tried, divest himself of outstanding distinction and greatness. His life and work are before us for emulation by those who, with scientific attainments and ability, have yet their lives before them. We are grateful for the fact that the gas industry has an important link with Faraday, and we are pleased that the industry has been one of the vehicles through which the benefits of his discovery of benzene has developed so much value in the world. It is interesting to know that a medal is being prepared which is to be awarded without regard to nationality, for outstanding achievements having clear relation with the discovery of benzene. The first recipient of the medal is Mr. James Morton, in special recognition of the signal services he has rendered to science and industry in this country, during the last ten years, by developing and extending the manufacture of anthracene dyestuffs, and more recently by extending their application to silk and wool. The discovery a hundred years ago, and the developments that have been made upon it, have for the country powerful lessons which, if observed, should be bountiful in their results.

The Misfortunes of Coal.

ADVERSITY still obstructs the coal industry; and at present there does not appear even a loophole for escape. The relatively poor exports of coal, particularly to Germany, France, Belgium, and the Netherlands, continue. The position to which things have descended in this regard is well attested by the experiences of the first five months of the year. During that period, over 11 million tons of coal less were sent abroad than in the corresponding period of 1923, and more than 4 millions less than in that of 1924. The actual figures were: 1925, 22,114,598 tons; 1924, 26,248,766 tons; 1923, 33,220,230 tons. In addition to the falling-off in quantity, the values to-day are comparatively low. In the last five months, the total value of the exports, according to the returns, was only £23,143,815. In the same period last year, the value was £32,274,947, and in that of 1923, it was £41,464,651—an enormous drop in revenue for five months. In view of this, and the continued depression in our industries at home, it is not at all surprising that more collieries have been closed, and therefore there is more unemployment in the coal industry, as well as in coal-shipping, and in other sections of its transport.

In face of this, firebrands like Mr. A. J. Cook still talk of what he and others like him will do if they can get the major Trade Unions to follow their communistic flag and directions in the quixotic attempt to get more money for the miners, without in return giving more output to reduce the cost of production, so that a stronger competitive position can be built-up. The economic limits have been passed in many collieries; and the talk of visionaries and extremists will not change them. So much so is this the case (and we are extremely sorry to see it) that the excellent co-operative experiment at the Vauxhall Colliery, near Ruabon, came to an end—much to the regret of the participants—last Wednesday. Solely due to the diminishing price of coal is the fact that the colliery cannot be carried on at the present piece wage rates, which have to be coupled with the severe competition from the coal of other countries. The Resident Engineer at the colliery says that, if the sale price obtained in March had remained unaltered, the colliery would have been working to-day at a profit, and that through the increased exertions of the men. All concerned have been completely satisfied with the results of the experiment; but outside causes prevent its continuance without a revision of the terms. The output per man increased, and consequently the working costs were considerably lowered. It only required maintenance of the prices ruling about three months since to enable this really co-operative effort still to be a success. The colliery owners have made a suggestion to the men. Whether or not they will be able to accept it remains to be seen; but anyway the Company, it is stated, are willing to consider any scheme which the men may themselves put before them, subject to the project being one which would not occasion any loss.

Regarding the inquiry into the economic conditions of the

industry, there were two days' sittings last week of the Joint Committee of the Mining Association and the Miners' Federation. Up to the time of writing, there has been no official announcement as to the results arrived at. There is no mistaking the causes of the condition of the industry; they are as plain as the Houses of Parliament. But now that they have been discussed, the question of what is to be done is a more delicate matter. It was expected by the miners that the inquiry would have assumed a definite form last Thursday; but no positive suggestions were put forward from either side. It was, however, arranged that a further sitting should be held yesterday, when it was hoped that the owners would submit proposals for consideration. The idea is that the Mining Association will suggest something in the nature of longer hours or lower wages. That appears to us a very intelligent prognostication, in view of the fact that it is difficult to see what else they could propose. But, of course, working hours could not be altered without legislation, and by agreement with the miners. The prophets say that, if longer hours or reduced wages is a correct forecast of what the Mining Association will propose, then the miners will launch their new wage programme, and make counter demands, including a wage based on the cost of living. We must "wait and see" what is actually the upshot of the inquiry and discussions. But at the moment, though the indications are clear as to only a single course being open to both sides, one side at all events will (if previous threats are reliable) object to pursue it. If this be so, then the certain thing in store is that matters will go from bad to worse, because no union of labour, however strong, can override economic reverses. What they can do is to work, if they choose, to mitigate them.

Coke Competition.

The Editor of the "Journal" thanks the competitors in the Coke Competition whose papers have already been received. May we remind those who have still to forward their contributions that the latest date for their reception is next Tuesday, June 30?

Speculation and Ignorance.

At the Faraday celebrations last week, Dr. H. E. Armstrong made use of these words: "We are too prone to speculate—often too inconsiderate in speculation—but little alive to our own individual ignorance, too little apt to cultivate that breadth of vision and proportionate judgment which are at the root of scientific method." As we read these words, our mind travels over the advocacy of low-temperature carbonization for the making of gas for the supply of the needs of cities and towns.

Nota Bene.

It is observed that, through the influence of gas engineers and managers in different parts of the country, extracts have appeared in local papers from the Presidential Address of Mr. J. Ferguson Bell to the Institution of Gas Engineers. This is an excellent idea, and advantage should be taken of all possible occasions to obtain similar publicity in all quarters of the country. In one paper before us, the points of the address particularly noticed are the progress of the gas industry in public service, and the discussion as to the intentions of the Government regarding electricity supply.

Gas from Fuel Oils.

A good deal of attention appears to have been directed recently to the production of gas from heavy fuel oils; and it is suggested that this will compete for industrial purposes with town gas. It is more likely that, if fuel oil gas comes along in practicable and commercial form, it will compete not with town gas, but with producer gas. We have lately been hearing of the "Hackol" process (introduced by Mr. J. E. Hackford), in which heavy oils of a specific gravity of ·950 and upwards are used. Much experimenting has been necessary in order to discover a generator which is free from objection. Mr. Hackford believes he has found one, which relies upon the heat of partial combustion to provide a sufficient temperature to crack the oil into gas, and to carry on the cracking indefinitely. It is also claimed that a constant composition of gas is maintained; and that its thermal value is from 155 to 190 B.Th.U. per c.ft. Only a small space is required for the generator. The inventor suggests the possibility of selling the gas at about one-third the price of town gas, and at about 66 p.ct. of the price of producer gas with coal at 24s. per ton. Are these prices based on the respective thermal values? There will be no disturbance in the gas industry over this competitor any more than there has been over the introduction of producer gas. Should a greater demand in consequence grow for fuel oil of the class mentioned, present prices will ascend. It is not only space that counts with manufacturers in preferring to pay more per therm for gas on tap, but the trouble and inconvenience of running and maintaining a plant and storing the gas-producing materials. However, it will be interesting to have the results of working experience with the generator before definitely criticizing it and its performance. There is also reported from the United States an improved method of oil carburetting, which permits oils formerly regarded as fuel oils to be used for gas making. In this system no chequer work is used, but the cracking is effected by the hot refractory lining of the vessel and also the crown of the chamber.

Repetition.

We have had a fresh delivery of the prospectus of the South Midlands and Berkshire Electric Light and Power Company, Ltd. The "Limited" should be emphasized. The Warwickshire and South Midlands Electricity Supply Corporation, Ltd., are still offering, in the South Midlands and Berkshire Company, 9500 8½ p.ct. cumulative participating preference shares of £1 each, the income-tax on which is free up to 4s. 6d. in the pound; also 1000 7 p.ct. (guaranteed) first mortgage debentures at £98 p.ct. in multiples of £10 each. This is the undertaking which proposes to acquire a controlling share, debenture, and administrative interest in the Eynsham Gas Company, Ltd. It is intended "to instal electric light in conjunction therewith;" leaving gas to look after the heating, cooking, and power for the district. We are glad to see that these 43, Cannon Street, people are mindful of the advantages of using coke for steam-raising for the generation of electricity. But the title of the Company, the capital, the report of the Auditors, Turner & Co., and much else are an insult to people of ordinary intelligence. We hope there are not many below normal intelligence who will be persuaded to invest in the concern. The mention of the Warwickshire and South Midlands Company reminds us of the Barford inquiry, in which Turner particularly cut such a melancholy figure; and he and the prime mover, Eaton, thought fit not to be present at the second day's proceedings [see *ante* p. 445].

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

June 26.—Waverley Association of Gas Managers.—Annual meeting at No. 129, Princes Street, Edinburgh. There will be an address by the President (Mr. R. Taylor, of Aberlady), and a paper on "Gas Ovens," by Mr. Arthur Forshaw, M.Sc., Chief Chemist to Messrs. R. & A. Main, Ltd. Luncheon and an afternoon drive and steamer cruise are included in the programme.

June 30.—Last Day for Coke Competition Papers.

July 9.—Coke Oven Managers' Association (Midland Section).—Visit to the works of Messrs. Stainby and Lyon, of Knottingley.

July 20-25.—Royal Sanitary Institute.—Congress at Edinburgh. H.R.H. the Duke of York has accepted the Hon. Presidentship of this Congress, at which Sir John Gilmour, Bart., Secretary for Scotland, will preside, and deliver the Inaugural Address. A health exhibition is to be held in connection with the Congress.

Sept. 15-17.—Irish Association of Gas Managers.—Annual Meeting in Belfast.

Oct. 19-21.—British Commercial Gas Association.—Annual Conference and General Meeting in Plymouth.

PERSONAL.

Mr. J. NEWELL REESON, Engineer-in-Chief and Technical Adviser to the Metropolitan Gas Company of Melbourne, is visiting England. Letters may be addressed to him, c/o Messrs. John Terry & Co., No. 7, Great Winchester Street, E.C. 2 (Agents to the Company), or c/o Union Bank of Australia, Ltd., No. 71, Cornhill, E.C. 3.

Mr. T. ANTHONY CANNING, Technical Assistant Engineer to the Newport (Mon.) Gas Company, and Past-President of the Wales and Monmouthshire Junior Gas Association, has been elected a Fellow of the Chemical Society. He is the eldest son of Mr. J. Herbert Canning, O.B.E., F.C.S., the Engineer and Manager to the Company.

Last month the Bombay Gas Company appointed Mr. CHARLES DONOVAN TERRY as their Assistant Manager and Engineer. Mr. Terry went to Mr. R. S. Ramsden as a pupil in 1920, and since completing his indentures had been on the technical staff at the Leamington Gas-Works. Before leaving for Bombay, he was presented by the staff and workpeople at Leamington with an inscribed wrist watch. Mr. Terry is the son of Mr. C. E. Ryder Terry, who has been connected with the gas industry for very many years.

Mr. JOSEPH WATSON, of Purston, has resigned from his position as Secretary to the Ackworth, Featherstone, Purston, and Sharlston Gas Company, after having held the position for about 49 years. He will be succeeded by Mr. THOMAS WALLER, who has retired from the Directorate of the Company to take up the duties.

Congratulations to Prof. J. W. COBB, C.B.E., B.Sc., F.I.C. He has been appointed Pro-Vice-Chancellor of the Leeds University. Although this election is a distinction which, we are sure, Prof. Cobb prizes very highly—particularly as coming in the first instance from his colleagues of the Senate—it is not a permanent office, and does not in any way supersede his appointment as Livesey Professor and Head of the Department of Coal Gas and Fuel Industries. The office was held, for instance, by Prof. Smithells at the time he resigned his Professorship of Chemistry, which he held along with the Pro-Vice-Chancellorship. One feature of the appointment, of which Prof. Cobb naturally must be proud, as indicating the position which Applied Chemistry has won for itself in the University of Leeds, is that for the first time the Senate have nominated as Pro-Vice-Chancellor a member of the Faculty of Technology.

The retirement on the 12th prox. of Mr. J. OLLIS, Chief Officer of the Public Control Department of the London County Council (of which mention was made at the recent annual meeting of the Association of Statutory Inspectors of Gas Meters), is referred to by the General Purposes Committee, who point out that he entered the service of the late Metropolitan Board of Works in 1882, so that he will have served the Council and their predecessors for a period of over 43 years, including nearly 19 years as head of the Public Control Department. The Committee desire to place on record their appreciation of the long and valuable services which Mr. Ollis has rendered to the Council and to London. His work has, they point out, embraced a wide variety of subjects, necessitating the display of considerable organizing ability and tact.

ELECTRICITY SUPPLY MEMORANDA.

THE protest of the gas industry against the suggested subsidizing of the electricity industry by the Government has raised greater interest in the subject than has done any other publicity; and it has even stirred some of the men in the electricity industry, who had only indolently looked at the subject from a distance, to make a close examination of it. We are charmed to remark that the electrical journals have thought fit to take notice of what is being said on the subject by the gas industry; but as is their strange custom, instead of treating the matter seriously, certain of them refer to what is said with a thin jocularity, and without any real attempt at controverting the points. This is all to the good. It evidences well the soundness and sense that reside in the arguments advanced by Mr. D. Milne Watson and others. There is another observation which shows how curiously erratic the electrical writers can be. Some of the very men who deride when the gas industry speaks on the subject have previously written against Government interference, have spoken of the risks of too much concentration of electricity generation, have mentioned that the increased transmission costs will negative slender savings in coal for generation, and have questioned whether any Government can, through electrical legislation, create a new heaven upon this much troubled earth by restoring industry, by way of electric power, to a state of prosperity—albeit the high costs of materials, labour, machinery, rates and taxes, and a few other odds and ends which go to make up industrial costs combine to inflict a load which has defeated all the best efforts of our brainy industrialists to gain ascendancy over their difficulties. Yet, when gas men who administer large interests, and have incomparably more business experience than their critics, speak against the principle of Government subsidies for industry, and point the mistakes of the politicians as to what electrical power can do or cannot do in re-establishing industry, the electrical writers are content to ridicule instead of to deal with the matter with a sense of responsibility. As we say, this is excellent, because anyone with an ordinary amount of intelligence will know why they do it. Anyway it would be an advantage if they would not, in their desire to ridicule the gas men who speak on the subject, change their own attitude in relation to it. A see-saw policy does not manifest a good balance.

A Good Sign.

Since the addresses and speeches of Mr. Milne Watson criticizing the electrical intentions of the Government, there have been several letters in the daily Press. We have referred in previous "Memoranda" to some of the more interesting of these. There has been interest in reading another published in "The Times," by Mr. R. W. Dron, of Glasgow, in which he alludes to the expectations that have been raised by one political party after another regarding schemes of electrical development and coal carbonization. Those "expectations," we remember, have ranged from a saving of sufficient coal and money to pay off the National Debt in a few years to the placing at the disposal of every rural cottage electrical energy at a price never before dreamed of for lighting, heating, cooking, knife and boot cleaning, and for making land crops grow in a manner which they have never shown any disposition to do before, and to place the cow under the operation of yielding her product in a style which will give happiness and delight to both her and her owner. These predicted miracles have made many electrical men blush, and they have remonstrated with the authors because they know full well that their dream cannot materialize; for any attempt to cause it to do so would simply add costs which would make the supply generally dearer than cheaper. Through these vague and idiotic promises, Mr. Dron finds that the public, although somewhat confused by them, are inclined to acquiesce in the expenditure of vast sums of money in the hope that the results will follow in due course. If this expenditure takes place, there will in good time be enlightenment as to what will really happen. On this point (as on others) Mr. Dron makes a sensible remark. He says it should be clearly realized that the burden of the expenditure in super-power stations, main transmission lines, and the standardization of frequency will fall on our industries to-day, whereas the benefits, if there should be any, will only be reaped in a somewhat remote future. We talk of Government subsidies; but nothing much has been said of the sources of such subsidies. The greatest taxpayers are industry and commerce; so that what the Government are proposing to do—we emphasize the word "proposing"—is to make the cost of electrical energy a shade lighter, and to extract largely from industry and trade the money to do it. We see no advantage in that; and should the attempt fail, it will be another illustration of the stupidity of political interference in a matter which is best left to development in the natural course of things, and by those competent and interested in bringing about the best conditions. Again and again, says Mr. Dron, it has been demonstrated that the proposed super-power stations cannot effect the reduction in overhead costs which optimistic politicians predict, and that the provision of main transmission lines in advance of the probable demand for electric supply is an uneconomic proposition. While the standardization of frequency is for many reasons desirable, at the present stage of development the technical and financial difficulties are enormous, and the resulting benefits are very problematical (though Mr. Dron does think this is a different matter) that it would be a good thing if a standard frequency —say, 50 cycles per second—were adopted for future developments. We agree fully with him that "before the country sanctions capital expenditure, on the schemes of politicians, it must be demonstrated that the call for these is urgent, that the results are reasonably assured, and that there are insuperable difficulties in the way of private enterprise. Certainly these conditions have not been complied with in the political proposals for electricity or coal carbonization."

Commonsense Considerations.

The electricity reorganization schemes of the Electricity Commissioners appear to advance to a certain point, and then come to a dead-stop. Precisely as we thought would be the case—what the Electricity Commissioners would like to see come about by quick process is being largely accomplished by allowing things to take their own

Developing Without Joint Machinery.

developing course. Take, for example, the Aire and Calder Electricity District. The local authorities in the West Riding have received from the Directors of the Yorkshire Electric Power Company a communication in which they state that they have reluctantly decided that further attempts to carry out the Commissioners' scheme for the reorganization of supply in the Aire and Calder District will be of no avail. Therefore, the Company are proceeding with the development of supply as entrusted to them in their last Act. In respect of uniformity and efficiency of supply, the position in the West Riding has already reached the development sought by the Commissioners. Working in close co-operation, the Power Company and the large municipalities are at present producing about 90 p.ct. of the electricity sold in the area, and elimination of small and uneconomical stations is proceeding in a natural manner without recourse to any joint scheme such as was formulated in 1921. The complete supersession of the few remaining small generating stations is assured by the provision which is being made for extensions. Then why trouble about a Joint Authority and compulsory powers?

Cheaper than Gas.

Our electrical friends suffer from a peculiar twist in their imaginations, and hyperbole with them is sound reasoning. On May 27, we referred to the heating of bath water at Poplar by means of electricity; in the "JOURNAL" for June 3, there was published a letter from Mr. Horace Bowden; and a comment on it appeared in the "Memoranda" on June 10. Our electrical friends regard, as a proper basis for comparison in this matter, electricity supplied at a shade above the average cost of coal delivered at the electricity station, as against the ordinary flat rate cost of gas in the district. We are sorry to see that they persist in looking upon this as perfectly fair, while at the same time failing to recognize that they are paying a tremendous compliment to gas. "Meteor" in the "Electrical Times" says that, in his original allusion to the matter (to which reference was made in our comments for May 27), he showed that electricity actually worked out cheaper than gas for heating at the Poplar Public Baths; and the advantage was so considerable that the use of gas was discontinued. The contributor of "Cooking and Heating Notes" to the same paper remarks that the gas industry does not like it noised abroad that electricity has proved cheaper than gas for water heating at the public baths, and that the gas apparatus has been removed in consequence. Whether or not Mr. Bowden can justify the supply of electricity at a price a shade above the average cost of coal delivered at the generating station is not at the moment the point in dispute, though we deny absolutely that that gentleman has in any way justified the charge from the commercial point of view. What we are complaining of is that there has been no justification of a comparison of that charge with the figure at which gas is supplied for lighting in the district. Apart from this, in our original criticisms, there were various matters referred to, to which neither Mr. Bowden, Mr. Hope, nor our friends of the "Electrical Times" have replied—one of them being the amount of coal that, on Mr. Bowden's own data, must be used at the electricity generating station in excess of coal-fired boilers to obtain the same quantity of heat for raising the temperature of the water to the point mentioned by Mr. Hope in his paper. In the "Electrical Review" we notice a letter from Mr. J. E. Gilbert, in which he says that, to the superficial reader of Mr. Hope's paper, his conclusion may be misleading, inasmuch as he has compared a moderate electric storage system with a very out-of-date coal-heated type. Mr. Gilbert contends that, had the Baths Superintendent at Poplar experimented with his 4000-gallon tank with heat derived from small coal or anthracite furnaces, the results would have been more satisfactory. However, all that our friends seem to be able to do is to thump on the note that electricity at the Poplar Baths, supplied at a cost a small fraction above the average cost of coal delivered at the generating station, is cheaper for heating water than gas supplied at the local lighting rates! We think, as they cannot do better than this, we may leave the matter, with a further remonstrance to "Meteor" as to a statement which appeared in his notes for June 4, that the "JOURNAL" wrote that "selling electricity at the cheap rate in question is said to be an impudent stunt." As a matter of fact, the words "impudent stunt" were taken from "Meteor's" own notes preceding our first reference to the matter. He then remarked "Our friends the gasmen always assume the electric heating of water to be an impudent stunt." We are sorry that in "Meteor's" excitement over the matter, his own expressions and phrases are attributed by him to us. Perhaps in calmer moments he will recognize that this is not cricket, and will remember that there have been other occasions on which it has been necessary to make the same protest, in view of his propensity for extravagance.

Mr. Walter S. Allen, J.P., who was Chairman of the Atherstone Gas Light and Coke Company, Ltd., left estate of the gross value of £24,027, with net personalty £22,375

OPENING OF NEW SHOWROOMS AT LOUGHBOROUGH.

On Thursday, June 11, new showrooms and offices of the Loughborough Corporation Gas Department were formally opened by the Mayoress, Mrs. G. H. Bower.

Situated in The Rushes, the new building has on the lower floor a polished teak shop front with two large plate-glass windows on either side of the entrance doorway, with leaded lights above. The upper floor is in brickwork, with Tucker's "Multiruf" facings. In the centre is a large oriel window with gabled roof, which is covered with Westmorland slates. On entering the building, one is at once in a convenient showroom, 34 ft. long by 19 ft. wide, with a polished hardwood floor, and fitted with special arrangements for displaying in operation the latest gas fires, geysers, cooking ranges, and lighting burners. Among the latter are indirect bowl fittings with distant control. At the back of the showroom is an oak counter and screen dividing-off the cashier's office; and at the rear of this is the Manager's office, the general clerks' office, and book room. On the first floor, reached by a staircase at the side of the cashier's office, are the Committee room and a store room. The building was designed by Messrs. G. H. & A. M. Barrowcliff, Architects, of Loughborough, and erected, under their supervision, by Mr. A. Faulks. On the new building coming into occupation, the Manager's office in Green Close Lane will be used as a gas testing laboratory.

OPENING CEREMONY.

The Mayoress was presented with a silver-gilt key, suitably inscribed, by Mr. A. M. Barrowcliff, the Architect, with which she unlocked the building.

The MAYORESS, in declaring the offices open, said she had noticed with satisfaction the improvements in cooking stoves, which, she hoped, would benefit the users.

Mr. G. W. LLOYD JAMES (the Chairman of the Gas Committee) moved an informal vote of thanks to the Mayoress.

The visitors and guests then made a tour of inspection of the showroom. Afterwards about a hundred of the company adjourned to the College canteen for tea, at the invitation of the Chairman and members of the Gas Committee.

Col. PIERCEY, in proposing the toast of the "Loughborough Corporation Gas Department," congratulated Mr. James and his Committee on the handsome offices they had built, and complimented the Manager of the gas-works, Mr. E. Onions, upon the ability he had displayed.

The CHAIRMAN, in reply, referred to the early history of the gas-works. They were originally established by Mr. G. Livesey, and were purchased from him in 1836 by a Company for the sum of £1686, the plant at that date being necessarily small. In 1868 the Local Board decided to seek Parliamentary powers to purchase the undertaking, but at a meeting of ratepayers an adverse vote was recorded, and the proposal was dropped. Thirty-one years later, in 1899, the authorized capital of £48,750 having been expended, the Company were seeking powers to increase their capital, when the Corporation also decided to promote a Bill for the purpose of acquiring the undertaking. The Corporation were successful, and the Company withdrew their Bill. The purchase price was determined the following year by arbitration, and the Corporation entered into possession on July 1, 1900. The cost of the undertaking to the Corporation was £102,154—more than double the capital value of the Company. The amount of gas made in 1900 was 70 million c.ft. To-day it was 160 millions. The number of consumers in 1900 was 2500, while at present there were 6156. Gas for cooking was not so popular in 1900, the number of stoves at that time being 400. To-day there were 4794 stoves in use.

PRESENTATIONS.

A presentation by the employees of the Gas Committee was made to Mr. Onions. This took the form of a smoker's cabinet, which was handed to the Manager by Mr. Sutton, who has been in the gas-works 53 years. A presentation of an inscribed piece of silver plate was made to Mr. Onions by the Gas Committee.

Institution of Civil Engineers.

At the Conversazione of the Institution of Civil Engineers, which was held on Wednesday last, there were one or two exhibits of interest to readers of the "JOURNAL." Dr. J. S. Owens exhibited his method of counting dust particles with the settlement dust counter, and showed microphotographs of the dust particles in the air taken outside Vigo Harbour, at the mouth of the St. Lawrence River, and in Surrey. Slides demonstrated the flue dust from a hand-fired boiler furnace and from a pulverized coal fired furnace. A cement-spraying apparatus was shown by Prof. S. M. Dixon. This machine throws cement mortar by a jet of compressed air. The mixture is blown through a rubber tube 2½ in. in diameter, without nozzle. The mixture ordinarily used is 6 to 1, fairly dry; and the coating becomes hard immediately. The air required is 220 c.ft. per minute at a pressure of 3·5 atmospheres; and the amount of cement thrown is 1 cub. yd. per hour. Carbon dioxide measuring instruments, due to Dr. Ezer Griffiths, were exhibited by the National Physical Laboratory.

CENTENARY OF BENZENE.

Honour to Faraday.

THE centenary of the discovery of benzene by Michael Faraday was celebrated on Tuesday, June 16, by the Royal Society, the Chemical Society, the Society of Chemical Industry, and the Association of British Chemical Manufacturers. The lecture theatre of the Royal Institution, in which the gathering took place, was filled by many distinguished scientists of this country and from many parts of the world.

The Duke of Northumberland (the President of the Institution) received delegates from many institutions, and said they were met to honour the discoverer of benzene and to call the attention of the rising generation to the motives which inspired Faraday's life, which made him a great scientific genius and a great man. The discovery of benzene had had the greatest material effect on the world, as being the foundation of the major section of organic chemistry. It was directly or indirectly the raw material from which manufactured dyestuffs were made. We who led in the discovery of chemical dyes had seen the key industry which resulted from it pass into foreign hands, and others receive the birthright which belonged to us. He was glad, however, to say that the situation was altering, and that we were regaining the position which rightfully belonged to us. The most distressing feature of our time was our failure to link up scientific methods and discoveries with the public service; but perhaps the present serious state of many of our great industries and the necessity for seeking new methods and new sources of power would teach a lesson which adversity alone could teach.

Prof. H. E. Armstrong rightly remarked that Faraday was one of the greatest experimental philosophers the world had known. He began his career as a chemist; and the range of his chemical activity was astounding. As one of the earliest workers in organic chemistry he stood pre-eminent. He not only discovered benzene, but three of the five chlorides of carbon, and he was the first to study the sulphonic acids, a class of compound now of great technical importance. The discovery upon which they based that commemoration, that of benzene, would always rank as one of the most fundamental discoveries of chemistry. If not the hub of the organic section of the chemical industry, benzene was at least a major part of it. Benzene only acquired technical importance from 1856 onwards. An enormous amount of credit was due to Perkin, who not only discovered the first aniline colour, mauve, but founded the original dyestuff industry. Nothing that had happened since Faraday made his discovery would have given the philosopher greater pleasure than the advance of our knowledge of the origin of colour—a subject which once filled his mind. By some uncanny process, Faraday had prophesied what the X-rays were now justifying.

Addresses praising the work of Faraday were delivered by foreign and British scientists; and several men of scientific eminence were elected hon. members of the Royal Society.

The Earl of Balfour said they would have been neglectful of their duty if they had not asked the world to join in celebrating the memory of one of the greatest men in science, perhaps the greatest experimenter the world had produced. They were celebrating the centenary of what was the first of the great discoveries associated with the name of Michael Faraday. It was the first of a long series of discoveries which succeeded each other with almost bewildering rapidity. In the 'thirties, and in the years following in which some of these discoveries were made, there existed profound political discussion in which parties were bitterly divided in storms of political controversy. He had often thought how strange it would seem if people could be brought to realize that the quiet worker within the walls of that institution was having a greater effect on the development of civilization, the welfare of mankind, and the progress of commerce and knowledge than anything which was doubtless important in the disputes of politicians in the evolution of society. They might look where they would at the modern state of knowledge and industry, and they would see that almost all, if not absolutely all, the most striking developments which had happened either in the world of industrial production or scientific speculation were associated with the name of Faraday, and intimately connected with his discoveries. In the course of the last 25 years there had been the most amazing developments in the general conception of the physical universe in which our lot was cast. They were all intimately connected with the discoveries of Faraday. In regard to modern theories of electricity, of the constitution of the atom, and of the arrangement of the atom within the molecule, Faraday's discoveries had had the greatest effect, and constituted the most profound speculation ever made into the constitution of matter, which was now the glory and the astonishment of the age in which we lived. Broadly speaking, the fact remained that in the world of practice and the world of theory Faraday was one of the greatest builders the world had ever seen.

CELEBRATION BANQUET.

The Duke of Northumberland presided at a celebration banquet at the Hall of the Goldsmiths' Company. Scientists from all parts of the world were present, among them being Sir Alfred Mond, M.P., Mr. Milne Watson, Prof. Bone, Sir Dugald Clerk, and Mr. E. V. Evans.

The toast of "The Immortal Memory of Faraday, Chemist and Philosopher, Discoverer of Benzene," was submitted by the President, and acknowledged in silence.

Sir Alfred Mond, M.P., proposing the toast of "Chemical Science and Industrial Art," spoke of the far-reaching effects of scientific discovery on daily existence. Faraday, whom they were celebrating, was one of those outstanding men to whom science was not divided into fields, but was in itself one great field. If scientific knowledge were more general than it was to-day, our attitude in regard to the application of science to medicine, agriculture, industry, and, in fact, to everything concerning life, would be based on something better than observation, assumption, or conviction. Each new discovery opened a way for more fundamental and still greater knowledge. The progress of humanity was marked in each successive stage by its conquest over nature and its utilization of nature's boundless wealth. The future prosperity of the world, the solution of its economic difficulties, the security of its teeming millions, depended far more upon its scientific progress, upon its increased power to produce wealth by the application of scientific thought and method to its industrial problems, than to any other force of human effort.

It has been decided to award a medal, without regard to nationality, for outstanding achievements in relation to Faraday's discovery of benzene. The first recipient of the Centennial Medal is Mr. James Morton, of Carlisle and Grangemouth, in recognition of his work in developing and extending the manufacture of anthracene dyestuffs.

An interesting exhibition was arranged at the Science Museum, South Kensington, commemorating the centenary of the discovery of benzene by Faraday. Exhibits showed the importance of benzene to the synthetic dye industry, and illustrated the distillation of coal tar, from which benzene is obtained on a commercial scale.

LAUNCHING OF THE "FIREGLOW."

A new steamer, the "Fireglow," was launched for the Gas Light and Coke Company on Friday last, June 19, from the yard of Messrs. S. P. Austin & Son, Ltd., of Sunderland.

In responding to the toast of "Success to the 'Fireglow,'" proposed by Mr. W. H. Dugdale, Managing Director of the building firm, Mr. D. Milne Watson, Governor of the Gas Light and Coke Company, said that during the war his firm were forced to build or buy 18 vessels, 12 of which were lost. They now had eleven vessels, the "Fireglow" making the twelfth; and they were looking forward to the launch of yet another from that yard at an early date. These boats helped to carry coal for their great works in London to the extent of 1,200,000 tons a year, so they would see the important part that shipping played in the activities of the Company. He was glad to know, having regard to the depressed conditions on the Wear, that of the five ships now building on the Wear two of them were for his firm. Trade was in a serious state in this part of the country, and it was difficult to see any way out. He could not help feeling that they were constantly looking in the wrong direction for a solution. Everyone seemed to be looking to the Government for help—for the Government to wave a magic wand, or find a panacea to help the country out of its difficulties, and re-start trade. He believed that lower taxation and strict economy by the Government would do a great deal, but that the country would be saved only by its own exertions—in other words, by self-help. Unfortunately, this was not the fashion to-day. They were told that, if the Government would only start an electricity scheme and link-up super-stations throughout the country, they would have the country back on its legs again; unemployment would disappear, and the country would boom with trade. The gas undertakings were prepared to meet electricity, given a fair field, without fear. They could not believe that a big Government electricity scheme would achieve the desired object. He pointed out that the north-east coast had probably the most efficient electricity service in the country. The costs were very low—as low as they were to-day in Chicago. Yet the north-east coast was plunged into the deepest depression. Therefore electricity did not appear to be the means by which a revival of trade was to be brought about. He emphasized that in gas manufacture only 15 p.ct. of the heat value of the coal was lost, whereas in electricity 80 p.ct. was lost. There was also a suggestion for saving the country by the adoption of low-temperature carbonization. Up to the present it had not proved to be a commercial success. The idea existed that, if the Government spent ten millions of public money, trade would be restored; whereas it was not believed that ten millions of private money would achieve the same object. Both masters and men must face the situation; and if they conferred together, ultimately a solution would be found.

Success to the new ship was proposed by Mr. W. H. Dug

dale; and Sir John S. Hindley, of Messrs. Stephenson, Clarke, & Co., proposed the health of the builders and the engine builders, the North-Eastern Marine Engineering Company, Ltd. Mr. Dugdale and Mr. Adams responded for the respective firms.

The "Fireglow" has a length of 225 ft. and a breadth of 36 ft., and is designed to carry 1850 tons deadweight.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Visit to Cambridge.

On Saturday, June 20, the Association visited that remarkable town Cambridge, which is such a delightful mixture of the old world and the new. About 180 members and their ladies took part in this visit, which, thanks to the excellent arrangements made by the Cambridge University and Town Gas Light Company, and in particular by Mr. J. W. Auchterlonie, the Engineer and Manager, proved of unusual interest and enjoyment.

During the morning the members inspected the Cambridge Gas-Works.

DESCRIPTION OF WORKS.

The works consist of three retort houses. There is a horizontal house comprising ten beds of 8's, machine stoked by Jenkins De Brouwer machinery. The second house consists of inclined retorts—ten beds of 6's set at an angle of 32°. The third house is a new horizontal house which has just been completed. The settings, which were constructed by Messrs. Gibbons Bros., consist of eight beds of 8 retorts placed in four tiers of 2's; the size of the retorts being 24 in. by 15 in. by 22 ft. long. Cort's anti-dip pipes have been installed, and two 12-in. Parkinson & Cowan retort-house governors have been fitted on the foul mains. There are ascension pipes and hydraulic mains on each side of the house. This house is to be operated by the latest type of Jenkins De Brouwer charging and discharging machines; and the coke plant consists of a "D. B." coke conveyor discharging into a screening plant and reinforced concrete hoppers which will hold large and broken coke and screened and fine breeze.

Outside the house a new condenser has been erected of the horizontal cross-tube type by Messrs. W. C. Holmes & Co. From this the gas is taken by a 24-in. main to the exhausters. The exhausting plant consists of three sets comprising a new 300,000 c.ft. per hour exhauster, one of 80,000 c.ft. per hour, and a 100,000 c.ft. per hour twin set, all by Messrs. Bryan Donkin & Co.

The washing plant comprises a Holmes "P. & A." tar extractor, a Kirkham, Hulett, & Chandler centrifugal washer, and a Holmes horizontal brush washer. This plant has a capacity of 2 million c.ft. per day. An additional washing plant to deal with 3 million c.ft. per day is to be put down during the next few months.

The purifiers are situated in two distinct units which can be worked separately, the first house being the most modern. It contains four boxes 40 ft. by 30 ft. by 6 ft. deep. These are mounted upon a steel-framed structure, with brickwork enclosing three sides of the building. The boxes were constructed by Messrs. C. & W. Walker, Ltd., and the lids are fitted with Clapham "Eclipse" joints. The second house contains three boxes 30 ft. by 20 ft. by 4 ft. 6 in. deep, and three water-lute purifiers which are used as catch boxes.

There are two station meters of 80,000 and 50,000 c.ft. per hour respectively, made by Messrs. Parkinson & Cowan, as are also the station governors. There are two Humphreys & Glasgow blue water gas plants, the combined capacity of which is 1½ million c.ft. per day.

The present holder capacity is somewhat limited, being only 1,700,000 c.ft. of town gas and 300,000 c.ft. of blue water gas. A new gasholder tank is in course of construction, and this will accommodate a holder of 3 million c.ft. capacity. The tank when finished will be 100 ft. in diameter by 38 ft. deep. It is being constructed by Messrs. R. Robinson & Co., and is of mass concrete 4 ft. thick at the base continuing for 17 ft. and tapering to 2 ft. 3 in. at the ground level. Steel bars 4½ in. by ⅝ in. are placed round the tank at 4 ft. 6 in. centres embedded in the wall; the first ring being 9 ft. from the base. The proposed holder is to be a three-lift column-guided one.

It was found that a retaining wall was necessary along the boundary of the works and the River Cam haulingway, to support the gasholder tank. This wall has just been completed, and consists of mass concrete panels to which piers were built afterwards. The height of the wall is 11 ft. above ground level, and the thickness of the piers is 1 ft 3 in. and the width 1 ft. 6 in. The total length of this wall is 412 ft. 6 in. A ½-in. expansion joint has been left at the ends of each panel.

The boiler house contains three Lancashire boilers, 30 ft. by 8 ft. 6 in., by Messrs. John Thompson, Ltd., fitted with Goodrich & Hamlyn furnaces. The power house contains three steam electric generating sets of 50, 75, and 175 KW. capacity, by Messrs. Allen, of Bedford.

Over the power house a water softening plant is situated, and a deep well pump supplies water to a tank over the water softener, which forms the roof of the power house. This tank contains 25,000 gallons, and supplies all the water to the works.

An electric boosting plant of 300,000 c.ft. per hour was put down in 1923, and this is used for boosting gas from No. 2 holder on to the station governor, the excess being driven into No. 4 holder.

Practically the whole of the tar produced is dehydrated and used for tar spraying by the Local Authorities.

The liquor is only worked-up to 10-oz. strength at present, and is conveyed by barges to King's Lynn, where it is used for sulphate of ammonia manufacture.

Naphthalene troubles are not experienced at Cambridge, no doubt due to the use of a Parkinson vaporizer.

LUNCHEON.

After the inspection the members were conveyed to the Lion Hotel, where, with their ladies, they were the guests at luncheon of the Directors of the Gas Company. After the honouring of the Loyal Toast,

The Rev. E. C. PEARCE, D.D. (Master of Corpus Christi College, and Vice-Chairman of the Cambridge University and Town Gas Light Company), who presided, extended, on behalf of the Directors of the Company, a hearty welcome to the Association. Cambridge, he said, was an ancient town; but the Directorate of the Gas Company were anxious that this adjective should not apply to the gas-works. The members, during the morning, had been able to see what steps were being taken to render the works thoroughly modern.

Mr. W. NEWTON BOOTH (President of the Association) said that he had been asked to perform, on behalf of the Association, what was a pleasant but rather sad duty. This was to ask Mr. W. H. Noble, Assistant Hon. Secretary of the Association, to accept an illuminated address in recognition of the valuable work he had so willingly done for the benefit of the Association. Mr. Noble was leaving the country for the United States of America. They were all very grateful to him, and hoped that in his new sphere he would not forget the Old Country.

Mr. NOBLE, in thanking the Association for the address, which, he said, he would always value very highly, gave them his assurance that he would never forget the happy period he had spent with the Association.

Mr. NEWTON BOOTH then thanked the Directors of the Cambridge Gas Company, and Mr. Auchterlonie, for the splendid interest and entertainment which they had provided. As the Chairman had remarked, Cambridge was an ancient town; but the gas-works were anything but ancient, and reflected great credit on the Directorate and engineering staff. The members of the Association would long remember the enjoyable and useful visit.

Mr. W. L. WESTBROOK proposed, and Mr. A. BROADBENT seconded, a vote of thanks to the Directors of the Cambridge Gas Company, and to Mr. Auchterlonie.

This was carried with acclamation.

The Rev. PEARCE, in reply, voiced the regret of the Chairman of the Company (Mr. Parker) at being unable to meet the Association. As for the arrangements which had been made for their visit, the credit was due to Mr. Auchterlonie.

Mr. AUCHTERLONIE said that he had a warm corner in his heart for the London and Southern District Juniors, and was very pleased to offer them a welcome.

During the afternoon the party visited some of the Colleges. The weather was perfect, and the "backs"—always charming—were more delightful than usual.

A very successful visit was brought to a close by tea, at the invitation of the Chairman and Directors of the Gas Company, at the Lion Hotel.

Coke-Oven Gas for Town Supply.

The Gas Companies of Albany, Schenectady, Troy, Cohoes, Rensselaer, and Watervliet have contracted to take between them the entire supply of gas from the coke ovens of the Hudson Valley Coke and Products Corporation at Troy (N.Y.), which are expected to be in operation some time next autumn. Approximately $6,000,000 will be the cost of the plant, which is to occupy an area of about 50 acres. Ultimately there will be three batteries of 55 ovens each, though at the moment only one unit of ovens is under construction. Thus the production at first will be 1000 tons of coke a day, and 5 million c.ft. of gas. When more gas is needed to serve the cities dependent upon the plant, there are blue water-gas generators which may be put into commission to furnish fuel for the ovens; while if the total production of the ovens is not enough, carburetted water gas sets are provided to supplement the capacity. The plant is planned to be elastic enough to meet any peak loads that may arise in the territory.

Visit to Derby.—Mr. Ferguson Bell writes to say that, before leaving for London on the Monday in Institution week, he placed his Assistant Engineer, Mr. J. P. M'Crae, in charge of the arrangements for the visit to Derby. Mr. M'Crae, with numerous other members of the staff of the Derby Gas Light and Coke Company, worked with enthusiasm, and to them much credit is due for the success of the visit.

THE LEEDS AND NORTHRUP POTENTIOMETER PYROMETER.

The following description of this useful piece of apparatus is based on particulars supplied by the Integra Company, Ltd., of Birmingham, who are the British representatives of the Leeds and Northrup Company.

It is becoming more and more recognized that the potentiometer pyrometer presents many practical advantages. For instance, the readings are entirely unaffected by the resistance of the thermocouples, lead wires, switches, or any contacts in the circuits. The readings, therefore, are unaffected by the length and cross-section of the thermocouples and lead wires. This is an exclusive feature of the potentiometer. There is complete and accurate compensation for the temperature of the cold junction. No accessory devices such as thermostats, buried cold junctions, &c., are required. Changes in the temperature of the instrument itself do not affect the readings. The potentiometer is inherently constant in its accuracy. Two elements, and two only, are required to be constant. One of these is the resistance of manganin, which has been proved to remain constant to 1/25 p.ct. The other is the voltage of the Weston standard cell. This also has remained constant to 1/25 p.ct. while in use for more than twenty years. Pyrometers seldom require an accurary better than $\frac{1}{4}$ p.ct. (5° in 2000°).

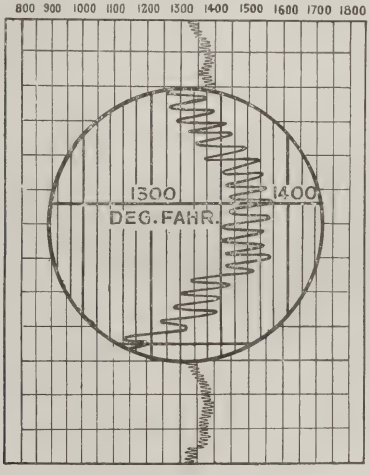
Owing to their principle, and in spite of their great accuracy, the potentiometer recorders are robust machines, for the only sensitive moving part in the instrument is the galvanometer, which is not calibrated, but serves merely as a current detector. A small electric motor with automatic governor absorbs the frictions, drives the recording mechanism (switching, printing, unrolling of the chart), and acts as a servomotor to set right alternatively the resistance and the slide wire so far as the galvanometer needle does not stand motionless. This motor has a surplus of power which is available to operate various signal devices without affecting in the least the sensitivity of the apparatus.

Application to the Gas Industry.

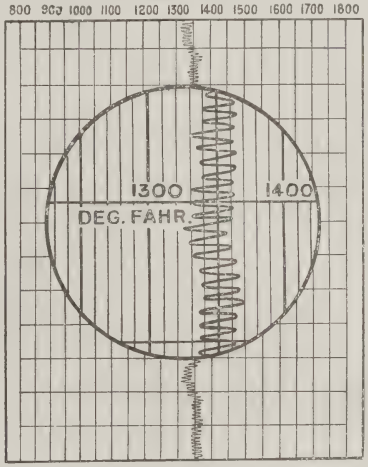
Gas engineers are agreed that present-day oils require close temperature control. Furthermore, as the specification and sale price are set by law or contract, profits depend almost entirely upon savings effected by skilful operation and the elimination of all waste. Take an average present-day oil of about 31° Bé. Best gasification is obtained, let us say, at about 1400° Fahr. in the superheater. Now, a low temperature will fill the seal pots with partly cracked oil and not a little undesirable tar. On the other hand, a high temperature brings excess naphthalene and lamp black to emulsify in the wash box. Either way ends in costly trouble and an inferior product. Consequently, to avoid all these difficulties, and keep within the profit zone, it is essential to use accurate temperature measuring equipment. The "L & N" signalling recorder is, in this way, a great help to the gas-maker. In addition to the graphic record, this apparatus gives visual signals with electric lights—red, white, and blue—high, correct, and low, respectively. Moreover, a deviation indicator gives on a dial the number of degrees one is away from the correct temperature. The recorder may be placed at any distance from the superheater—for instance, on a table in the engineer's office. The deviation indicator and signal lamp attachments are, of course, before the eyes of the operator. These flashing signals are ideal for attracting his attention. As a result, when the temperature starts to change, it will be noticed immediately, and can be restored promptly. Without the signal lights, the change would continue until the gas-maker happened to look at the instrument, and considerable trouble might result from even a short delay.

The "L & N" continuous charts reproduced here were made from a set that had just been equipped with a signalling recorder. [It may be mentioned that the diagrams are recorded by the apparatus in red ink.] Though taken only two weeks apart, marked improvement is shown. These two charts are conservative in picturing the gains to be made by the use of accurate temperature guides. Many sets are operating with greater variation than the 120° Fahr. shown on the chart to the left; but with the help of a signal-light recorder, they can be held within a range of 50° Fahr. or better.

To terminate this article, we would mention that for a certain type of water gas machine, the Leeds and Northup Company manufacture a master temperature controller which automatically maintains the temperature constancy in the superheater.



This record was made immediately after the recorder was connected, but without reference to it as an operating guide. Although an attempt was made to hold the average temperature constant, it varies from 1300° to 1420° Fahr., a variation 120° Fahr.



This record was made after two weeks' use of the "L & N" signal-light recorder as an operating guide. The average temperature has been held between 1325° and 1375° Fahr., a variation of only 50° Fahr. The sections of the charts in the circles are full size.

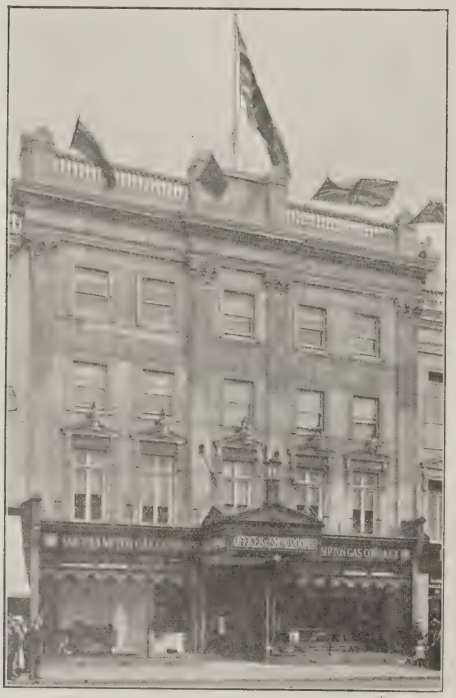
Cast-Iron Research.—The Council of the British Cast-Iron Research Association have recently extended the research programme by arranging for an investigation on the influence of silicon, manganese, and phosphorus on the formation of graphite in cast iron, to be conducted by Mr. M. L. Becker, M.Sc., at the University of Manchester.

Paint on Gas-Works.—Mr. Jacob B. Jones, Superintendent and Treasurer of the Bridgeton (N.J.) Gas Light Company, has been discussing in the pages of the "Gas Age-Record" the value and importance of the attractive gas-works. One matter to which he refers is the painting of gasholders. The management, he points out, is interested in getting the best covering that it can, for the longest space of time, at the lowest cost. The neighbours, on the other hand, are not interested in this at all; they want to know what colour it is going to be. In a case he quotes, the quality of the paint was decided upon, but several test sheets were prepared in order to show the different colours. Then invitations were sent out to all the neighbouring owners; and it being a residential neighbourhood, the subsequent conference was largely attended. It was agreed that a decision by a majority of those present should be considered final; and strange as it may seem, the decision was unanimous. Pursuing his subject, Mr. Jones says: If you really want to make the gas plant an attractive place to visit, aluminium paint on condensers, scrubbers, pipelines, and general plant equipment may be well worth your consideration.

SOUTHAMPTON'S NEWEST ATTRACTION.

Ideal Working Conditions and Service to Consumers.

Southampton is a beautiful town, from both natural and architectural points of view; and one of its features is an excellent shopping area in the main thoroughfare, to which was last week added a still further attraction in the form of new offices and showrooms for the Southampton Gaslight and Coke Company. The continuous growth of the Company's business having rendered the old premises in Ogle Road insufficient for their purpose, and the desirability having been recognized of coming out into the busiest street (though, as a matter of fact, Ogle Road itself turns out of the main thoroughfare), Mr. J. R. H. Jacobs, F.C.I.S., F.S.A.A., the Company's energetic General Manager and Secretary, looked about him, and was fortunate enough in due time to find what he wanted. During the war an hotel in Above Bar—a stretch of the long straight business thoroughfare to which reference has already been made—was purchased by the Y.M.C.A. for use as a hostel, and therefore the licence was given up. When its use for this purpose came to an end, it was in the market; and it is a portion of this former hotel that the Gas Company have acquired. Excellently indeed have the Architect (Mr. Harry J. Weston)



New Showrooms at Southampton.

and his partner, Mr. Gordon L. Thorne, under whose supervision the work was carried out, adapted the site to its new use.

THE GROUND FLOOR.

The first impression that is conveyed to the mind of the visitor is one of "roominess." There can be no crowding here, either of staff or of apparatus; and it will be possible to accommodate simultaneously any reasonable number of consumers or prospective customers. Thus has one of the cardinal points to be aimed at been secured.

The windows—one on either side of the main entrance—are, of course, large; and it is intended to maintain interest on the part of the general public by changing the contents of one window every week, so as to give each display a fortnight's run. For the opening, two excellent settings had been arranged, based on British Commercial Gas Association suggestions for window displays, with Mr. Jacobs's additions. "After the game, a refreshing bath," was the wording to one tableau, which showed a tennis court, and one of the players proceeding to a tempting gas-equipped bath. In the other window was a street scene, picturing mainlaying operations, with the watchman by his coke fire, and wording drawing attention to the advantages of this form of solid smokeless fuel. Lengths of main lying in the foreground had painted on them the names of villages on the borders of the Company's district, so that the people of Southampton might know exactly the extent of the area of supply. The names of these villages were Botley, Hedge End, Lyndhurst, Chandlersford, Hythe, and Fawley, some of which already enjoy, while others will shortly, the benefits of the Company's service. Readers will have noted in last week's "JOURNAL" the report of an inquiry by Mr. H. C. Honey into an application by the Company to the Board of Trade for a Special Order having for its object, among other things, to extend the area of supply. Each window is beautifully lighted by a 1500 C.P. row of inverted incandescent gas lamps designed by Mr. J. W. Lofts, of Messrs. William Sugg & Co., to meet the special circumstances. They are on distance control. A channel running the length of the window above the lights takes the products of combustion into a flue leading into the chimney. This installation is proof of the efficacy of gas for the lighting of shop windows.

The front showroom, which is 46 ft. wide and 68 ft. long, has been fitted up in a highly attractive manner, and in accordance with the most modern ideas. Everything is good, and of a type completely suitable for the purpose which it is intended to fulfil. In the centre, pylons are being arranged for the effective display of gas fires, as are to be seen in the British Empire Gas Exhibit, while on one side are arranged a model working kitchen and a bathroom—the latest forms of apparatus for cooking and water heating being demonstrated. In connection with the bathroom, one point may be specially mentioned. The Company have recognized, as have others, that, in connection with certain housing schemes, where the bath is provided on the ground floor, there is an advantage, from the builder's point of view, in providing one heating medium for both wash-copper and bath. They therefore show a gas-heated copper, fitted with a syphon arrangement of their own design, by means of which practically the whole of the heated contents

Showing Model Bathroom.

of the copper can be transferred to the bath. To achieve this object no increase in the length of the legs of the wash-copper has been found necessary. Of the lighting of the showroom, by Evered's fittings, all having switches, no more need be said than that it is fully in harmony with the handsome surroundings. The oak panelling of the walls and the teak-block floor are in keeping with the predominant idea—which has been to represent gas appliances in a homely setting.

No one will enter the showroom without giving attention to a fine display of fruit and vegetables bottled and crystallized. This is the work of Miss Baverstock, the Company's Lady Demonstrator, and many readers will remember looking—with feelings of something more than admiration—at the glass case containing these tempting specimens, when it was on view last year in the British Empire Gas Exhibit. As a matter of fact, the Company, at the instance of the Government, started this work for the forces during the war; and finding there was a demand among the consumers, they have continued it since. Consumers having a stock of fruit or vegetables which they desire bottled may apply to the Company; and it is done for them in their own houses—for which service a small charge is made.

At the rear of the showroom is the general office, 36 ft. wide and 68 ft. long, with a counter for the public in front, separated from the showroom by an oak and glazed screen. There is accommodation here for a large staff to work in the greatest comfort. The top lighting of this general office is very striking; and first-rate artificial illumination is provided by Sugg semi-indirect lamps, on distance control. On one side are several private offices, and a comfortable waiting room for the use of the public.

At the back are other offices, stores, and lavatories, and a staff entrance in Vincent's Walk, with accommodation for bicycles in the yard adjoining.

GROUND FLOOR, SHOWING ENTRANCE TO OFFICES.

Other Floors.

The old hotel staircase, although it was tucked-away in a dark corner, when brought to light by the removal of the surrounding walls, was found (under many coatings of paint) to be rather a fine piece of work in solid mahogany; and this has been retained and made to fit-in with the alterations. An electric lift, in addition to the staircase, serves all floors.

On the first floor the old hotel rooms have been converted into offices, and a new oak-panelled Board-room, 20 ft. wide and 38 ft. long, provided in the rear, with access to the flat roof over the general office below. This has been arranged as a roof garden. The second floor has been fitted-up as offices, &c.; while the third floor provides spacious accommodation for the two caretakers. The old cellars of the hotel have been adapted for use as strong rooms and stores.

An important item is the conference hall, with direct access to Vincent's Walk. This is 24 ft. wide and 36 ft. long; and it is intended that it shall also be for the social use of the Company's staff. In order that it may be perfectly applicable to both these purposes, it is provided with a sliding platform, which can be removed from view when not required.

A House-Warming.

From what has been said, it will have been seen that the Southampton Gas Company have taken a step which will inevitably lead to increased business—firstly, by making the working conditions ideal, so that the staff shall give of their best; and, secondly, by affording ample facilities to the public to acquire a perfect understanding of the multifarious uses and advantages of gas. The new venture received an excellent send-off last Thursday, with the formal opening. The Chairman of the Company (Mr. J. C. Moberly, M.A.) presented the Mayor of Southampton with the necessary key, and his Worship the Mayor (Alderman T. M'Donnell, J.P.) then unlocked the door and declared the showroom and offices open. The word "formal" has been mentioned, but in reality there was nothing whatever that was formal about the occasion. Members of the Corporation, Directors, and officers of the Company, with a few visitors, made up a "family party," the most appropriate description of which perhaps would be "friendly relations." Exactly what is meant by this will be gathered by readers who noticed in last week's "Journal" that, in the report of the proceedings before the Board of Trade, regarding the Company's application for a Special Order, the significant statement was made that objections were raised by the Southampton Corporation, but certain amendments to the Order were agreed between the Company and the Corporation.

Following the opening, about fifty sat down to luncheon in the conference room; and in the speeches which followed, the existence of this spirit of friendliness was emphasized, and was recognized as being mutually advantageous. The Chairman presided, and was supported by the following members of the Board: Sir H. W. Russell Bencraft, J.P. (Deputy Chairman), Mr. A. W. Oke, Mr. R. C. S. Pearce, Mr. Joseph Cash, and Col. E. K. Perkins, C.B.E., M.P. The Auditors were there—Mr. F. J. Burnett, F.S.A.A., and Mr. A. H. Cobbold. As to the officials, in addition to Mr. Jacobs, there were present Mr. F. Durkin (Resident Engineer and Man-

ANOTHER VIEW OF THE GROUND FLOOR.

ager), Mr. F. Lewis (Accountant), Mr. E. Dunbar (Assistant Engineer), and Mr. F. Pitman (Cashier). The guests included the Mayor, the Deputy Mayor (Alderman W. Mouland), the Sheriff (Councillor J. E. Silverman), the Town Clerk (Sir Richard Linthorne, O.B.E.), Mr. F. C. Carter (President of the Southampton Chamber of Commerce), Mr. H. C. Head (Winchester), Mr. T. Carmichael (Portsmouth), Mr. F. J Falkner (Romsey), Mr. Charles Clare, and Mr. R. Stephenson Clarke. Both Mr. Clare and Mr. Stephenson Clarke were particularly welcomed, because the firms of Messrs. Fletcher, Russell, & Co., and Messrs. Stephenson Clarke & Co. have for very many years had particularly close business relations with the Southampton Gas Company. Mr. F. W. Goodenough was to have been present, and to have responded to a toast, but to the great regret of all an urgent business engagement kept him away. Councillor F. R. Brown (the Chairman of the Municipal Electricity Department) would have been there with the Electrical Engineer, but both were in Brighton at a conference. Mr. Brown, however, wrote: "We both appreciate the good feeling existing between your Company and our undertaking."

Sir RUSSELL BENCRAFT (after the honouring of the Loyal Toast) proposed "Our Guests," and remarked that the Company worked in great amity with the Corporation. He also paid well-deserved tribute to Mr. Jacobs and his efficient staff.

Mr. H. C. HEAD, responding, congratulated both the Company and the town on the very fine premises they had seen opened that day. A gas company should, he said, have adequate showrooms and offices. Indeed, such an undertaking would not be doing its duty to the town it served if it did not provide headquarters worthy of a commodity that was supplied, for one purpose or another, to probably 95 p.ct. of the inhabitants. In many places the public service rendered by the gas company to the community was not sufficiently recognized. He felt that in their new showrooms and offices the Southampton Gas Company were giving an excellent lead to other undertakings in the district. In these days no business could be successfully conducted without publicity; but it should always be remembered that a satisfied consumer was the best form of advertisement. They wished the Company all success and prosperity in their new home.

The MAYOR submitted the toast of "The Southampton Gas Company," and spoke of the cordial relations existing between the Company and the Corporation. The Company were at present seeking powers to extend their area. The Corporation might have contested the Special Order step by step and line by line, and so set up a big fight; but instead of this he himself with the Town Clerk met the representatives of the Company at the offices of the Parliamentary Agent, and in twenty minutes, in the most cordial manner, every little objection was removed. [Applause.] The Corporation were determined that, as far as lay in their power, all difficulties that might arise should be solved by friendly deliberation. The Company's undertaking was one of the largest and best organized industries in the town, and was deserving of all consideration.

Mr. MOBERLY, in response, remarked that during the 35 years he had had a seat on the Board he had been amazed at the progress of the industry, and at the ignorance of those who persisted in going about saying that "gas was on the wane." Nothing could be farther from the truth; for the industry had never been in a stronger position than it occupied to-day. The Company were at the moment increasing their works to meet the demands for gas, and were seeking an Order to extend the area, in order to satisfy the clamour by neighbouring parishes for a supply. He was confident that amicable relations would continue so long as they had with them their genial and tactful General Manager, Mr. Jacobs. The Directors felt that they owed those fine premises, too, to the energy, enterprise, and ability of Mr. Jacobs, in conjunction with his old friend Mr. Harry J. Weston, who had acted as Architect.

The staff were not forgotten, for later in the day about 130 were the guests of the Company at tea in the new premises.

On the following afternoon about 300 of the stockholders inspected the new premises, and were afterwards entertained at tea.

Benzole Sales in Germany.

In the current issue of the "Iron and Coal Trades Review" it is mentioned that, in order to guard against the dangers arising from irregular Franco-Belgian sales, the Bochum Syndicate of Germany have initiated steps with a view to bringing about an understanding with the French and Belgian benzole producers. The proposals are said to have been favourably received and promise to lead to satisfactory results. The first thing required is the creation of firm syndicates in France and Belgium. The German Syndicate will then be able to place their experience in propaganda work and sale policy at the disposal of these syndicates, and pave the way for the increase of deliveries in both those countries. At the same time efforts will be made to lead the benzole finding its way into Germany into a uniform channel—that is, through the organization of the Benzol Syndicate, in order to check in this way the present sale of foreign benzole in Germany at low prices. It is also proposed to work in the direction of bringing about a stabilization in prices by the conclusion of an agreement under which, in the event of a shortage of benzole arising in one or other of the interested countries, compensation deliveries would be supplied by the country having a surplus.

YORKSHIRE JUNIOR GAS ASSOCIATION.

Presentation to Late Secretary.

On the occasion of the June meeting of the Yorkshire Junior Gas Association, during a visit to the works of the Wakefield Gas Company, a presentation was made to Mr. F. A. C. Pykett, the late Hon. Secretary of the Association, now Distribution Superintendent at Lancaster. Mr. Pykett was Hon. Secretary for three years.

The presentation, which took the form of a handsome Jacobean oak bureau bookcase, subscribed for by the members of the Association, was made by Mr. E. Gillett, the President of the Association, who referred to Mr. Pykett's three years' excellent and enthusiastic service. Mr. Pykett had always given his best to the Association, both before and during his Secretaryship, and they all hoped he would find his new sphere of activity pleasant and profitable, and that he would long be spared to enjoy the gift.

Mr. Pykett, responding, said he had done what he could for the Association because he felt that it was the duty of every member to put in the best of which he was capable on behalf of all, whether it was in some definite office or in the more modest position of an ordinary member. He thanked the officers and Council, and the members generally, for their support during his Secretaryship, and for their generous gift.

THE "ABBIRKO" SUCTION SERVICE CLEANSER.

Gas engineers are agreed that it is preferable to withdraw the material forming the stoppage in a service pipe, rather than force it into the main. The advantages are obvious, and include the following:

The stoppage cannot recur by the same material again passing into the service pipe.

The stoppage cannot be aggravated by forcing more loose matter into the elbow or bend at the junction to the main.

The area of the main is not reduced by repeated clearing of the services.

The material causing the stoppage may be examined.

To obtain the above results, it is essential that a very powerful vacuum be obtained, and maintained throughout withdrawal; and to be effective this suction should be applied suddenly, in order to give the necessary shock action to loosen any solid accumulation. In addition the apparatus should be reasonably portable. The above ideals are admirably carried out with the "Abbirko" suction cleanser, manufactured by Messrs. Abbott, Birks, & Co., of No. 113, Newington Causeway, London, S.E. 1. The energy required is obtained by a storage of air pressure up to 300 lbs. per sq. in. in their Renrut No. 34 high-pressure cleanser, and released into the suction service cleanser by means of a patent instantaneous piston release valve. This operates a piston which in turn suddenly extends a collapsible reinforced vulcanized bag, causing a powerful suction. The material withdrawn is intercepted by an easily detachable filter. The whole is portable, strongly constructed of best materials, and most reliable in action. This cleanser, it may be mentioned, has cleared solid-blocked services 18 ft. long by 1½ in. diameter, containing wet rust, naphthalene, and other matter.

"Metallon"—A New Anti-Corrosive.

Corrosion and the various processes for its prevention have always interested gas engineers. We hear that a new process has now been placed upon the market whereby a protective metal film can be placed on iron, &c., cold, with a brush in a similar manner to ordinary paint. This material, known as "Metallon," forms a protective couple with the underlying iron. No pickling process is necessary, consequently the metal is not weakened and an alloy is not formed on the surface of the underlying material. The simplicity of application also allows repairs to be carried out *in situ* at a minimum of expense and disorganization. Another interesting property of "Metallon" is that it will not peel, blister, or lose colour up to the melting-point of the metal from which it is composed. Thus, aluminium "Metallon" will maintain its appearance and protection up to 659° C., or 1220° Fahr. The key obtained by the material is exceptionally good; and we understand that it will adhere to a glass surface with such firmness that it is impossible to remove by any ordinary means. The possibility of satisfactorily metal-coating asbestos flue pipes—say, with copper—for rendering their appearance more attractive has frequently been discussed by both the gas industry and the various makers concerned. It seems possible that "Metallon" would meet this demand cheaply and effectively. The havoc of corrosion is estimated to cost this country £100,000,000 per annum. We hope that this new material may be able to reduce this expenditure. In any case, in view of the inventor's claims, it would seem to be worthy of investigation by the gas industry.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Visit to the Works of the Consett Iron Company, Ltd.

The Association were fortunate enough to be the guests, on Wednesday last, June 17, of the Consett Iron Company, Ltd., of Consett, Co. Durham. Among the most enterprising of north-country firms, the Company control collieries, coke-ovens, brick works, blast-furnaces, and up-to-date steel works.

It was to inspect the silica brick works and the Wilputte coking plant that the visit was arranged—the former being claimed to be the most up-to-date in the country, if not in the world, and the latter being the only one of its kind in the Kingdom.

The Company are past masters at entertaining in this way. They have plenty of good things to show, they show them to the best advantage, and under cross-examination they display frankness and patience in explanation which satisfy even the most curious. Thus the visit was made most enjoyable, and from the points of view of both interest and instruction it was acclaimed a great success.

The party, which included the President, Mr. W. W. Atley, of Stockton, and the Hon. Secretary and Treasurer, Mr. Norman S. Cox, of Sunderland, numbered between 45 and 50. The majority made the journey to Consett by chars-a-bancs, through the charming scenery of the Derwent Valley, which always surprises those who imagine that the county of Durham is composed exclusively of pitheads, slag heaps, and unsightly mining villages. Fortunately, both for the journey of about an hour, and for the inspection, the weather was fine.

Arrived at the Templetown Brick Works—the first objective of the visit—the members were met by Mr. E. J. George, General Manager of the Company, and Mr. A. H. Middleton, Superintendent of the Coke and Brick Works, and other officials, who, without delay, divided the party into groups, and began personally conducted tours of the works.

The Templetown Brick Works.

A short description of the works was given in the "Journal" on the occasion of the visit last autumn of the Coke-Oven Managers' Association ["Journal," Oct. 22, 1924]. In view of the great interest and admiration displayed by the Gas Managers on the present occasion, some further details of the plant may well be recorded.

The works are devoted entirely to the manufacture of silica refractories, the raw material for which is obtained from a large royalty, containing an excellent quality of ganister, situated within a few miles of the works. The rock undergoes a preliminary sorting at the quarries, and is then brought to a storage yard at the works, where washing and further sorting are performed. Constant supervision and testing of the material in all stages of manufacture, from the raw to the finished product, ensure the maintenance of the requisite quality, and the selection of the ganister best suited to each particular purpose. Research and routine tests are carried out under ideal conditions in a splendidly equipped and up-to-date laboratory, which was one of the first objects of interest to be inspected.

Crushing, Weighing, and Mixing.

A swinging-jaw crusher, capable of dealing with 12-in. cubes, reduces the ganister to 3-in. size. The crushings are then elevated and further reduced to 1-in. size by a similar machine. The material is next automatically fed into a gravity-bucket conveyor, which distributes it to weighing pans. Automatic discharging of the buckets and weighing are accomplished by a very interesting device. The buckets are tipped by gear which goes out of action when a weighing pan has received the requisite weight of material, and re-engages when the pan has been emptied.

The fine crushing is accomplished, with the addition of a carefully measured quantity of milk of lime, in either of two mills of the revolving-bottom type; the period of grinding varying according to the use for which the finished material is required. The crushing weights, and also the weight of the charge ground, can likewise be varied to suit the ultimate product. A normal amount dealt with at one charge is about 18 cwt. An automatic tipping device delivers the silica mud to tipping bogies in which it is conveyed to hoppers, which supply the moulding tables.

The Moulding Process.

All moulding is done by hand on steel pallets; the Company not having discovered any machine moulding process which can be relied upon to give the accuracy of size and shape which they guarantee. Steel moulds with removable sides are used, made with the greatest care in the Company's own works. A very large variety of shapes is kept in stock, but special orders receive prompt attention. The moulders' work is very fascinating to watch, and the dexterity of touch in removing the moulds after beating the mud into them is remarkable. The ordinary bricks are moulded six at a time, and other shapes one or more according to size.

THE LABORATORY, TEMPLETOWN BRICK WORKS.

Drying the Shapes.

The shapes on their pallets are then loaded on to rack cars, on which they pass through a Proctor drying tunnel. This consists of a chamber 50 ft. long by 20 ft. wide by 6 ft. 6 in. high. In it are three distinct temperature zones, not separated from one another in any way, but produced by the arrangement and disposition of the dry-air inlet, the moist-air outlet, and a series of fans and heating coils. The temperature of the first zone is approximately 130° Fahr., and here the shapes remain long enough to be thoroughly heated through. The second and third zones are at about 145° and 205° respectively, and, in the whole process, moisture content is reduced from about 14 p.ct. to 0·09 p.ct. In the case of ordinary bricks, this takes about eight hours. Naturally the larger shapes require a longer period, and this is provided for in that three sets of rails run through the tunnel, on each of which a different rate of progress can be maintained. Eight cars can stand on each rail, the total capacity of the dryer being 14,976 bricks. As each car of moist shapes is fed in, a car of dried ones is discharged at the other end.

By this system, the shapes are dried in a continuously circulating atmosphere, humid in the preliminary stages, and gradually increasing in temperature. Heat is applied evenly to all surfaces, and unwanted stresses are not set up by the exterior drying before the heat reaches the interior—a most important consideration.

THE DRYING TUNNEL.

Burning.

Eight kilns are available for burning, each having a capacity of 100,000 standard bricks, or over 300 tons of material. The operation of stacking occupies more than three days, and great care must, of course, be taken so to arrange the shapes that there is sufficient space everywhere for expansion. The heating-up takes 12 to 14 days, a temperature of at least 1500° C. being attained. The kilns are then sealed, and cooling is by radiation only, the entire operation occupying four to five weeks.

The "set" material is then stored in dry sheds, where a rigorous inspection for size and soundness is made before dispatch. The running of railway sidings into the sheds considerably facilitates loading operations.

Mention of the careful control of every detail of the process has already been made. This is a feature to which the Company attach the greatest importance, and certainly all those present agreed that, judging from appearances, the finished products left nothing to be desired. The Company are large consumers of their own refractories in iron and steel works, and in their coking plant, so that the materials are under continuous test on the spot under actual working conditions. The lay-out of the works is admirably conceived, and the impression gained is one of ample space, smooth and expeditious working, and the maximum of consideration for the workers engaged.

The Company state that they have sold over 20,000 ft. of silica retorts, both vertical and horizontal, which are giving satisfaction in every case. The carbonizing time has been reduced by 20 to 25 p.ct., as compared with fireclay and semi-siliceous retort material, without any additional cost in heating the settings. In other words, this means that a works changing over to straight silica material as replacements become necessary would have its throughput increased by 20 to 25 p.ct. without further capital expenditure in putting-down more settings.

The Fell Coke Works.

A few minutes by road took the party to the Wilputte coke-oven plant, which is conveniently situated near the blast furnaces and the steel works, which are intended, when in full work, to be the chief consumers of the coke and surplus gas. A general description of the works was given in the "Journal" for Oct. 22 last, p. 237, to which reference may be made. The gas engineers on this occasion evinced considerable interest in the sister industry of coke making.

One of the chief centres of interest was the carefully controlled and efficient arrangement for heating the settings, which, of course, is entirely by their own gas. Every flue has its own regenerator, and the ovens are heated from both sides, there being 15 vertical flues on the coke side, and 13 on the ram side. Gas burns on one side in the vertical flues, and the products of combustion pass along a horizontal flue at the top and down corresponding flues on the other side, and through the regenerator. After half-an-hour, the process is reversed, and air is then drawn through the heated regenerator for the combustion of the gas which now heats the works and the regenerator on the other side.

The change-over is entirely automatic, and is worked by special gear situated near the meter and chart room, where the operations of the whole plant can be watched and controlled. An ordinary clock makes and breaks electrical contacts at the required intervals for reversing the flue circuits. A small pilot motor drives a commutator shaft, which is furnished with contacts, and these start and stop the change-over motors in proper turn. First of all a 5-h.p. motor comes into action and shuts-off the gas on one side of the battery. About 15 second later another motor reverses the air and waste-heat valves and dampers, and after 15 seconds more a third motor opens the gas cocks on the other side.

Considerable interest was displayed in seeing the pushing of the coke—an operation expeditiously performed for the size of charges. These are of slightly over 11 tons of coal per oven, giving a coke yield of 85 p.ct. for a carbonizing period of 15½ hours. The arrangements for quenching, elevating to the screens, and screening of the coke were all much admired, and the whole process and lay-out of the plant were generally agreed to be full of interest.

The Consett Company's Hospitality.

After a thorough inspection of the coking plant, an adjournment was made to St. Aidan's Hall, where the Consett Iron Company entertained the members at tea, Mr. E. J. George being in the chair.

Time was short for speech making, as many of the members had far to go after returning to Newcastle.

Mr. E. J. George, in a few words, said how glad his Company had been to welcome the Association and show them whatever there was to see.

The President, in returning thanks for the great hospitality offered, said that the visit, in addition to being of interest, had been also an education to most of them. Most striking to members of the gas industry were the carbonizing speeds attained, and the economy of space effected by the Wilputte plant.

Mr. George briefly returned the thanks of the Company, and

Mr. A. H. Middleton added how pleased he and his staff had been to receive the Association at their works. If any of them had not seen as much as they wanted, he would be only too pleased to receive them at any time in twos or threes, and go into more detail. He announced, amid general approval, that he had accepted an invitation from the President to read a paper at the October meeting of the Association, so that he would not at present say anything of technical matters.

With this the proceedings terminated.

Central Station Voltages and Charges.—Messrs. S. Rentell & Co., Ltd., of No. 36, Maiden Lane, W.C. 2, have published a little volume, at 1s. net, giving particulars of the principal central stations of the United Kingdom. The tables have been revised to the latest possible date consistent with the exigencies of printing.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Mr. Carr's Institution Paper.—The Heat Balance.

SIR,—In reply to the discussion on my paper on the "Selection, Design, and Construction of New Carbonizing Plant at Stretford," at the annual meeting of the Institution of Gas Engineers, I stated that I would communicate the figures of the heat balance on six days' experimental run of the plant, which shows an efficiency of carbonization of 82·04 p.ct. These figures are as follows:

Total heat units in raw coal.
1,538,783 lbs. Dry coal at 13,761·7 B.Th.U. per lb.
Total heat in therms = 211,762 = 100 p.ct.

	Therms.	P.Ct.
COKE—		
Potential heat in surplus coke (dry), 907,230 lbs. at 12,202 B.Th.U. per lb.	110,700	52·27
GAS—		
Therms per ton, 75·96 (corrected) potential heat in gas	53,962	25·48
TAR—		
Estimated yield, 76 lbs. per ton. Dry tar at 14,425 B.Th.U. per lb. Therms in tar	7,788	3·70
STEAM—		
Estimated heat recovered as steam from waste-heat boiler. Waste gases at 538° C. inlet temperature (estimated 60 p.ct. efficiency)	1,249	0·59
Total efficiency of carbonization	..	82·04

The figures relating to the heat value in the tar and steam from the waste-heat boiler are estimated. Observations taken over three months show that the yield of tar is approximately 82 lbs. per ton. In the above estimate, however, the yield has been taken at 76 lbs. per ton, as this was the average yield obtained with similar slack coals over a period of 12 months, but with the old horizontal settings equipped with ascension pipes and hydraulic mains.

In estimating the heat recovery by a waste-heat boiler, the efficiency of the boiler has been taken at 60 p.ct., although a much higher efficiency is guaranteed by the makers. It was considered desirable, however, that this should be taken on the low side, as the boiler was not in operation.

The high heating efficiency of the settings is attributable to the double regenerator, in which the regenerators on either side of the waste-gas flues are used for preheating the secondary air when the setting is working on its own self-contained producer.

Another point raised during the discussion was the speed of the coke telpher machine. The operating speeds are as follows:

Hoisting, full load . . . . . 75 ft. per minute
Travelling, full load . . . . . 600 ft. ,, ,,

The no-load and lowering speeds are in excess of the above speeds.

Gas-Works, Stretford, W. M. CARR.
June 17, 1925.

Sir Dugald Clerk's Institution Paper.

SIR,—Having read with great interest the paper given by Sir Dugald Clerk, K.B.E., D.Sc., F.R.S., M.Inst.C.E., at the Institution meeting, I am sure he will not mind my drawing his attention to the fact that gas for power purposes is not being sold in Sheffield for 6·4d. per therm, as he quotes; but the following prices are in operation, and have been so for about twelve months:

For gas supplied up to:

500 therms	7d. per therm
Over 500 up to 2,500	5½d. ,, ,,
,, 2,500 ,, 15,000	5¼d. ,, ,,
,, 15,000 ,, 30,000	5d. ,, ,,
,, 30,000 therms	4d. ,, ,,

From the above figures it will be seen that gas is sold at 4d. per therm in Sheffield, and a large number of the power users obtain it at that price.

Sheffield Gas Company, R. HALKETT,
June 18, 1925. General Manager and Secretary.

REGISTER OF PATENTS.

Manufacture of Sulphate.—No. 231,788.

GILL, H. A., of Chancery Lane, W.C. 2. A communication from Sté. des Fours à Coke Semet Solvay et Piette.

No. 31,230; Dec. 30, 1924.

The object of this invention is to provide a process of manufacture of sulphate of ammonia giving a perfectly dry and neutral salt, and possessing any acid character due to the presence of acid brine.

The invention is essentially characterized by the fact that, after draining, the salt produced in the saturator is washed with successive solutions of sulphate of ammonia more and more pure; the filtrate after each washing being recovered and used as the less pure washing solution, and the excess of this latter containing the largest amount of acid liquor being conducted into the saturator. The washing solution, composed of neutral sulphate of ammonia, may be alkaline, and for this purpose contain ammonia, ammonium carbonate or ammonium bicarbonate.

Blending and Briquetting for Vertical Retort Operation.—No. 233,508.

WOODALL-DUCKHAM (1920), LTD., and DUCKHAM, A. M'D., both of Grosvenor Gardens, S.W. 1.

No. 10,313; April 25, 1924.

By this invention a continuously operated externally heated vertical retort for carbonizing coal in a single stage at high temperatures, commonly used in the gas-works, is worked by charging it with fuel which has been prepared by blending and briquetting so as to produce a material of uniform chemical and physical characteristics; the patentees claiming that such preparation of the material for a continuous vertical retort under gas-works conditions is in itself a new operation, and obviates difficulties which arise in connection with the working of such retorts.

The following advantages are enumerated: Softening and swelling practically eliminated; high-volatile non-caking coals permissible; ready evolution of volatiles; uniform discharge; minimization of carbon deposit owing to free passage of gases; heat penetration improved; less breeze formed; better steaming conditions; and cyclic use of the pitch made—for binding the briquettes.

Coin-Freed Mechanism.—No. 233,539.

SMITH, E. W., and SMITH METERS, LTD., both of Kennington Park Road, S.E. 11.

No. 13,515; June 2, 1924.

This invention is for a modification of patent No. 219,252, abstracted in the "JOURNAL" for Sept. 3, 1924, p. 754.

The present specification provides that the coin table or lever has an upstanding arm the end of which is fashioned as a tooth or dog adapted to engage a toothed or notched quantity wheel; and a spring is placed in such position—say, coiled round the pivot of the coin table—that it tends to keep the tooth out of engagement with the wheel. This arm is positioned between the pivot and the coin position. The table may be flat, and on it is mounted a slidable block or distance piece adapted to be held by a screw at any required part of a groove formed in the table. This screw may be used alone, in which case it will be slackened and tightened to allow for the movement of and for the fixing of the block, or it may be used with or substituted by a spring washer or equivalent device, which will afford sufficient grip on the block to hold it at any point.

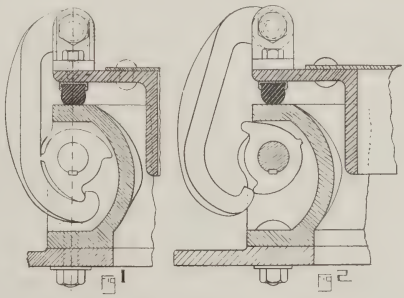
Purifier Lids.—No. 233,400.

CLAPHAM, T. A., and CLARE, R. J. W., both of Keighley.

No. 2819; Feb. 4, 1924.

This invention is for a means of securing the lids of gas purifiers of the well-known type.

Use is made of hooked links pivoted to the cover or lid of the purifier, or to brackets fixed thereon, and rotatable shafts with radial or cam-like projections; the shafts having bearings in the wall of the purifier or in the brackets, in such manner that the cams effect the operation of the links to bring the hooked extremities thereof beyond the plane in which lie the pivots of the links and the shafts. The shafts may each have a second radial projection against which the body of the link abuts when the lid is locked in position; this acting as a stop.



Locking Purifier Covers—Clapham and Clare.

A further "releasing" projection is provided on each of the rotatable shafts, this being so situated that, on the rotation of the shaft to unlock the hooked link, it advances into contact with the link and forces it outwardly to prevent its catching or partially locking itself.

The invention will be clearly understood from the drawings which we reproduce.

Coin-Freed Gas Meters.—No. 233,871.

METROPOLITAN GAS METERS, LTD., and FORSTER, J. D., both of Nottingham.

No. 10,777; May 1, 1924.

This invention relates to coin-freed meters of the kind in which a coin is supported at one portion of its periphery in a slot in a tumbler disc, and bears at the opposite portion against another disc in axial alignment with the former and between adjacent members

of a ring of teeth on the second disc, which is thus locked by the coin to the tumbler disc and will be rotated to adjust the meter mechanism. The tumbler disc is provided with a guide, or box, which directs a coin between two adjacent teeth on the toothed disc.

According to the present invention the box or guide is of a U or trough shape, having at one part a slot, so that it embraces the toothed ring in all positions to which it may be moved. This U-shaped guide is connected to the tumbler disc by means of inclined or diverging extensions secured on either side of the coin. The inner end of the guide so formed may be closed, thus providing a kind of pocket.

Thus, a coin proper to the apparatus will engage the slit in the tumbler disc and the teeth in the toothed disc, and the rotation of the former will ensure the rotation of the latter. A coin too small for the apparatus will merely enter the pocket without engaging the teeth. Also, the toothed ring is inaccessible for fraudulent manipulation.

Geysers.—No. 234,007.

Ewart, J. W., of Crouch End, N. 8.

No. 30,999; Dec. 24, 1924.

According to this invention, the water tray surrounding the vent pipe of a geyser is made integral therewith, and its outer edge or lip over which the water flows is detachably fitted to the upper edge of the cylinder forming the water jacket, and the top of the outer cylinder of the annular chamber is detachably fitted to the upper edge of the said cylinder. This construction of the tray and the top of the outer cylinder allows of their ready removal, and at the same time provides tight joints between them and the parts carrying them.

The horizontal passages through which the water flows from the water jacket into the annular chamber, instead of being arranged at the lower end of the said chamber, are now arranged at the upper end, to allow access thereto when the tray and the top of the outer cylinder are removed.

The condensation gutter is now made independent of the heater casing, and above or below the burner; being thus capable of easy removal.

Gas Ovens.—No. 234,292.

Glover, T., and Wayte, W. H., both of Norwich.

No. 14,266; June 12, 1924.

The invention, for gas ovens, comprises the employment within an outer casing of an oven chamber which is open at its lower end and closed at its upper end, and which is separated from the outer case by air spaces, one or more of which is or are used as a passage or passages along which hot gases can flow from the oven chamber to the outlet in the case.

The oven chamber is a separate unit which can conveniently be inserted within and removed from the outer case, so that the arrangement is particularly useful for the conversion of existing ovens.

After giving details of the construction, referring to diagrams, the patentees point out that the relative disposition of the parts is such that a space is left between the vertical sides, back, and top of the oven chamber and casing, and access is afforded to such spaces for the hot gases by perforations or gaps in the lower flanges of the oven chamber. Hot gases from the burners rise into the interior of the oven chamber, and circulate therefrom to the lower ends of the side or back spaces or both, up which they flow to the flue outlet near the top of the casing. While this is preferred, if desired the gases may escape at the lower end of the casing into the outer atmosphere, the spaces between the oven chamber and casing being then used to provide an air jacket for thermally insulating the oven chamber.

Locking Plug Taps.—No. 234,367.

Main, R. & A., Ltd., of Edmonton, N. 18, and Richardson, A. H., of Winchmore Hill, N. 21.

No. 25,262; Oct. 23, 1924.

This invention relates to a safety device for preventing unintentional turning of a gas plug-tap. The invention provides for a hinged flap suspended from a collar which embraces the supply pipe near the tap; and the catch piece is of such construction and comes into contact with the finger-piece of the tap in such position as to prevent the catch being thrown off when heavy pressure is applied to turn the tap.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for June 10.]

Nos. 14,234 to 14,788.

Adam, T. W.—"Prevention of caking of sulphate of ammonia." No. 14,506.

Brostrom, F. V.—"Gas burners." Nos. 14,315, 14,316.

Brostrom, F. V.—"Gas cocks." No. 14,317.

Brostrom, F. V.—"Gas pressure regulating device." No. 14,318.

Hammond, C. F.—"Gaseous fuel burners." No. 14,345.

Humphreys & Glasgow, Ltd.—"Automatic control means for gas-making apparatus." No. 14,690.

Jarvis, A.—See Adam, T. W. No. 14,506.

Kirkham, Hulett, & Chandler, Ltd.—"Apparatus for effecting intimate contact between liquids and gases." No. 14,416.

Marshall, F. D.—"Distillation, &c., of carbonaceous, &c., materials." Nos. 14,664, 14,709, 14,718.

Marwood, F. T.—"Gas cooking stoves." No. 14,732.

Mulholland, J.—"Incandescent gas fires." No. 14,402.

Pillinger, G. C.—"Supply and distribution of gas, &c." No. 14,321.

Slater, W. F.—See Kirkham, Hulett, & Chandler. No. 14,416.

Sunderland, L.—See Pillinger, G. C. No. 14,321.

Vidal, J. M.—"Apparatus for producing gas." No. 14,463.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

South Metropolitan Gas Bill: Read a second time, and committed.

Gas Light and Coke Company Bill: Read the third time, with the amendments, and passed; returned to the Commons.

Mansfield Corporation Bill; Read the third time, and passed; sent to the Commons.

Kilmarnock Gas and Water Provisional Order Bill: Read the third time, and passed.

A petition has been deposited on behalf of the London County Council against the South Metropolitan Gas Bill.

Gas Regulation Act.

Copies were presented of drafts of Special Orders proposed to be made by the Board of Trade under section 10 of the Act on the applications of the Colchester Gas Company and the Northampton Gas-light Company.

The draft Special Orders relating to the Trowbridge undertaking of the British Gas Light Company and the Haverfordwest Corporation were approved on the motion of the Earl of Clarendon on behalf of Viscount Peel.

HOUSE OF COMMONS.

Progress of Bills.

Blackpool Improvement, Oldham Corporation, and the Uckfield Gas and Electricity Bills: Read a second time, and committed.

Mansfield Corporation Bill: Read the first time, and referred to the Examiners.

On behalf of the Gas Light and Coke Company, a petition has been presented against the West Ham Corporation Bill.

MISCELLANEOUS NEWS.

ASSOCIATION OF STATUTORY INSPECTORS OF GAS METERS.

Annual General Meeting.

In the New County Hall, Westminster Bridge, S.W., on Wednesday, June 10, the annual general meeting was held of the Association of Statutory Inspectors of Gas Meters. Mr. H. N. Barrow, J.P. (Chairman of the Manchester Justices' Gas Meter Testing Committee), who is President of the Association, was in the chair.

By permission of the London County Council, and with the assistance of Mr. J. Ollis (a Vice-President of the Association), the afternoon was devoted to a visit to the Finsbury gas meter testing office. This testing office is one of the last to be installed, and the visit consequently proved both interesting and instructive.

The President, at the opening of the business proceedings in the morning, expressed his pleasure at seeing present so many representatives of authorities administering the Gas Measures Acts. The more the administrative authorities co-opted with the members of the Association, the better it would be for all of them. The authorities were most anxious to do their duty; and when there was co-operation with inspectors, who were now so well trained, and in every way thoroughly qualified for their work, the lay mind could get guidance from them in the carrying out of this duty. The Executive had held two meetings during the past year—one at Oldham and the other at Manchester; and he could assure them that the Association was going on in every way satisfactorily. Naturally, no great increase in the number of members was to be anticipated; but things were going along steadily.

The Hon. Secretary (Mr. W. Templeton, who is Chief Inspector at the City of Leeds gas meter testing station) read the minutes of the last meeting, and they were confirmed.

Consideration was then given to the annual report of the Council; the paragraphs being discussed *seriatim*.

Mr. George Hume (City of London), the Chairman of the Council, remarked that the regulations were working very well, and few controversial matters had cropped up during the year. The first paragraph of the report, which was in the following terms, did not require any explanation from him.

Meters with Novel or Unusual Features.

With regard to the question of receiving for examination and testing meters containing new or novel features, the Council were instructed at the last annual general meeting to communicate with the Board of Trade, with a view to the introduction of a statutory regulation dealing with this subject. The Council have considered this matter from various points of view; and there appears to be some difficulty in exactly defining new or novel features, and also in drafting a regulation in such form as properly to cover the matter and to assure uniformity of practice, and yet be sufficiently elastic to retain that individual discretion at present exercised by inspectors. The Council wish to have the considered opinion of the members before committing themselves further with the Board of Trade.

Mr. F. Coe (Nottingham) said he felt that, the Council having raised this question, the meeting should register its opinion that the opening of meters was not necessarily involved in this matter. No suggestion was made as to an alteration in the method of testing. These matters should be pointed out to the Board of Trade, in continuation of the correspondence that had been placed before the members. If then the Board did not see their way to make a regulation in accordance with their request, the Association would feel that they

had done what they could. He moved that they communicate with the Board of Trade to this effect.

Mr. H. WEBSTER (Brighton) saw no necessity for taking any further action in the matter.

Mr. W. KENYON (Sheffield) expressed the opinion that this question was very much bigger than it appeared at the moment to the members to be. He moved that a small deputation be appointed to confer with the Board of Trade, before the Association came to a final decision. The deputation, he suggested, should consist of the Chairman of the Council, the Vice-Chairman (Mr. S. B. Langlands), and the Hon. Secretary.

Mr. COE expressed his willingness to withdraw his own proposal in favour of this, if it better met the wishes of the meeting.

Mr. HUME said it was fairly obvious that the Board of Trade were not anxious to take up this matter and shoulder the responsibility In the meter that had raised the point it was not a question of measuring, but of prepayment attachment. If the members were seeking to become responsible for interfering with the automatic attachment, they would be taking on a very big thing. ["Hear, hear."] He thought it would be much better for them to remain where they were, and take no further action. The Board did not, he was sure, wish them to be responsible for the prepayment device. It was the opinion of the majority of the Council that they should take no further steps in the matter.

METERS FOR HOTEL BEDROOMS.

Mr. W. GORDON (Edinburgh), continuing the discussion of this paragraph, said that meters were now being supplied for hotel bedrooms, and similar situations; and they, as inspectors, were interested in the official badge being put on these meters. If they assented to the proposition that check meters need not have an official stamp, they would be doing wrong in the consumers' interests.

Mr. COE replied that his only idea was to let the Board know that the opening of meters was not involved in the Association's suggestion, and that they had in view no different method of testing from that which already existed.

After the resolution that a small deputation should wait upon the Board of Trade had been put to the meeting and negatived,

Mr. HUME remarked that Mr. Gordon's point was quite apart from the matter that had been under discussion. That gentleman raised the question as to whether hotel bedroom meters should come within the regulations of the Sales of Gas Act. So far as he himself was concerned, he believed that there was a difference of opinion on the matter.

Mr. S. B. LANGLANDS (Glasgow) said he thought the Act was fairly clear on the point. Section 13 of the Gas Regulation Act, 1920, was in the following terms:

> All meters by means of which gas is supplied by any undertakers to any consumer shall be stamped in accordance with regulations made by the Board of Trade under their powers in that behalf; and if any undertakers supply gas by means of any meter which is not so stamped, they shall be liable on summary conviction to a fine not exceeding ten pounds.

He held that the hotel proprietor became the "undertaker;" the person who used the measuring instrument was the undertaker.

FEES FOR TESTING HIGH-PRESSURE METERS.

The question was submitted to the Council as to what was the correct charge for examining and testing high-pressure meters. The Council drew attention to the fact that all high-pressure meters must be of a pattern certified by the Board of Trade before they shall be stamped; and the scale of fees should be in accordance with section 24, Gas Meter Regulations, 1920.

Mr. HUME remarked that they had no recognized way of charging. His own method was to charge double what he did for other meters; but this was entirely on his own initiative. The meter makers had not complained; but he would be glad of some ruling on the point.

Mr. F. COLBURN (Birmingham) said his charges were based on the capacity per hour, *plus* a testing fee of 3s. 6d. for the high-pressure index.

Mr. HUME pointed out that the Council thought the best method would be to include any additional charge that might be fixed upon in the supplementary memorandum which was issued by the Board of Trade.

Mr. F. A. ROLFE (London County Council) said it was not legal to charge anything beyond the ordinary testing fee; and something should be done to remedy this defect. The expenditure of an additional amount of time was involved; and the position was a most unsatisfactory one.

It was resolved that the Board of Trade be asked to include in their supplementary memorandum a charge for testing high-pressure meters.

REGULATIONS.

A memorandum was submitted to the Council requesting their interpretation of certain of the regulations. The question raised was as to whether a "Standard" meter should be regarded as a normal meter or as "unduly highly rated." After considerable discussion, it was decided to obtain statistics with regard to the testing of "Standard" meters from various offices; and the result of these figures confirmed the opinion of the majority of the Council. They recommend that "Standard" meters may be regarded as normal meters, and need not be considered as "unduly highly rated."

Mr. HUME said that with new "Standard" meters they had come to the conclusion that it was not necessary to have a double test. The report was that it was a very satisfactory meter. Of course, in the near future conditions might be so altered as to necessitate the amendment of this conclusion.

Mr. E. M. FOSTER (Exeter) thought they ought to have a rule, perhaps based upon the number of revolutions per hour. The meter should not be allowed more than a certain number of revolutions per hour without being marked "unduly highly rated."

Mr. COLBURN stated that, generally, there would not be 1 p.ct. of the new "Standard" meters rejected on the slow-speed test.

Mr. LANGLANDS said it was not the new "Standard" meters which came in for testing that weighed with him, but those which had been in use on the district.

Mr. S. WINTERBOTTOM (Manchester) told the meeting that out of 20,000 odd meters, his rejections were less than 1 p.ct.

Mr. G. W. KAY (Oldham) said he believed he tested a gross, and so little difference was found between the two tests of high rate and low rate that it was thought not to be worth while to go any further. He did not believe they rejected more than 1 out of the gross; and the time taken over two tests was not therefore justified.

Mr. F. W. DALTON (Liverpool) said that, with regard to testing meters at a lower rate than capacity, he so treated all dry meters—new, repaired, and old. They were tested at capacity, and also at one-sixth of their capacity; and it was found that the percentage of rejections of new "Standard" meters was very low. In the case of repaired meters, however, the percentage was much higher. In his office they tested about 36,000 meters a year, of which 20,000 were dry meters. It was found that the percentage of rejections of new and repaired meters was well over 5 p.ct. If, when new, a meter was tested at capacity and also at a lower rate, the chances of it being wrong when it came back after a few years were very much less than would be the case if in the first instance it had been tested only at capacity. A meter should register accurately when it was working at any rate within reason.

Mr. HUME added that in his own case disputed meters that came in from the district were generally put through two tests.

Mr. GORDON thought that, if they continued to have two tests at their own discretion, the valves might be set with greater care than if it became known to the makers that the meter was going to be tested only at full capacity. Therefore they should retain their discretion in the matter of testing.

This clause was agreed to.

10 C.FT. CIRCLE.

The Council were requested to consider whether it was desirable to approach the various interests concerned with regard to the introduction of a 10 c.ft. circle in all new dry meters, as a means of preventing meters with wrong dial plates, &c., getting stamped, which might possibly pass undetected in the ordinary way. The Council are decidedly of opinion that it is not desirable to re-open the question of the testing of indices, and a majority of the Council consider that the benefits to be derived from the introduction of the 10 c.ft. circle do not justify the demand for the compulsory adoption of this innovation.

Mr. DALTON pointed out that quite a number of meters had this 10 c.ft. circle, and that it was a great advantage to inspectors, who had a far better chance of seeing whether the meter index itself was registering properly.

Mr. COE suggested that, by the bringing forward of this matter, meter makers might be influenced to adopt the 10 c.ft. circle as stocks were replenished.

The clause was agreed to, as also was the following:

PUBLICITY.

A proposal was made that the Council should consider the desirability of circulating any item of general interest relating to gas meters and gas-meter testing that appears in the Technical and Daily Press. The Council, however, are of the opinion that the Technical Press is a sufficient medium for the needs, and that the purpose served by circulating news items would not justify the expenditure involved.

OFFICE BEARERS.

The HON. TREASURER (Mr. J. L. Barry) reported a satisfactory financial statement; the balance in hand being over £15.

The following office bearers and Council were next elected or re-elected:

President.—Mr. H. N. Barrow (Manchester)

Vice-Presidents.—Mrs. Councillor Shutte (Salford), Mr. J. Ollis (London), Bailie G. Gott (Glasgow), Bailie Buchanan (Edinburgh), Mr. C. Chambers (Birmingham), Mr. E. J. Gibbon Newcastle-on-Tyne), Alderman Vokes (Southampton), Councillor F. Unwin (Sheffield), Alderman P. R. Gayton (Exeter), and Mr. S. Dyson (Manchester).

Executive Council.—Mr. G. Hume (London), Mr. W. Kenyon (Sheffield), Mr. G. W. Kay (Oldham), Mr. F. Coe (Nottingham), Mr. S. Winterbottom (Manchester), Mr. S. B. Langlands (Glasgow), and Mr. W. Gordon (Edinburgh).

Hon. Secretary.—Mr. W. Templeton.

Hon. Treasurer.—Mr. J. L. Barry.

MR. OLLIS'S RETIREMENT.

The PRESIDENT said that in a very short time they would be deprived of the valuable help of one who had taken a great interest in the Association. He referred to Mr. J. Ollis, of the London County Council, who would soon be retiring. They all knew how greatly he had endeared himself to the members.

Mr. HUME proposed:

> "That this Association desire to convey to their Vice-President, Mr. James Ollis, Chief Officer, Public Control Department, London County Council, their best wishes on the occasion of his retirement from his office with the London County Council, and to express their appreciation of his assistance to the Association and unfailing kindness at all times."

Having been associated with Mr. Ollis for 28 years, he considered it a great privilege to move this resolution. They were much indebted to him for his help in framing the regulations which were in operation to-day.

Mr. LANGLANDS seconded the motion, and expressed his own high appreciation of Mr. Ollis's work.

Mr. CHAMBERS, on behalf of the administrative authorities, supported the resolution, which was unanimously passed.

The London County Council were thanked for the loan of the meeting room; and it was decided that next year's meeting should take place in Glasgow.

GAS REGULATION ACT APPLICATIONS.

The following notices have appeared in the "London Gazette" regarding applications to the Board of Trade under the Act.

SPECIAL ORDERS

Bideford Gas and Coke Company, Ltd.

To enable the Company to raise further capital, to make further provisions as to dividend and as to the supply of gas, and for other purposes.

Ilkeston Corporation.

To authorize the Corporation to supply gas in the parishes of Kirk Hallam and Shipley, to charge for gas on the thermal basis, to borrow money, and to make further provisions with regard to the supply of gas.

Ludlow Union Gas Company, Ltd.

To empower the Company to maintain and continue gas-works, to manufacture and supply gas, to raise additional capital, and for other purposes.

DECLARATION OF CALORIFIC POWER.

Sutton Gas Company.—500 B.Th.U., in substitution for 480 B.Th.U. (Oct. 1.)

Stretford and District Gas Board.—500 B.Th.U. (July 1.)

BIRMINGHAM GAS DEPARTMENT.

Question of Increased Charges.

The Birmingham City Council, at their meeting last week, debated the proposal of the Gas Committee that, as from the June readings of the meters, the price of gas be increased from 2s. 10d. to 3s. 2d. per 1000 c.ft.

Alderman J. H. LLOYD (the Chairman of the Gas Committee), who presented the report, pointed out that the Corporation had to look forward to a continuation during the present year of poor markets, not only for tar and ammonia, but also for coke, and were compelled, as were many other gas undertakings, to increase their prices to meet actual and prospective losses. Even with the increase proposed, their prices, notwithstanding their distance from the pits from which gas coal was obtained, compared very favourably with other undertakings in the country. Though at the moment there was little prospect of an alteration in the residual markets in their favour, the price of gas would be reviewed as soon as circumstances permitted. He complained of the action of the Finance Committee in calling upon the Department to make a contribution to the relief of the rates. This was done by drawing from reserves.

Alderman LANCASTER moved as an amendment that the following be added to the resolution:

> And the Gas Committee be instructed to inquire and report to the Council at an early date on the following matters: (1) The excessive staff and overhead charges of the Department. (2) What gas is being supplied to consumers at under cost price, and why. (3) Why a manufacturer using 1,000,000 c.ft. for power should be charged 5d. per 1000 c.ft. more than one using 5,000,000 c.ft. (4) Why should gas used for lighting be charged 4d. per 1000 c.ft. more than an equal quantity used for power. (5) What expenditure of a capital nature during the last few years has been charged to revenue.

He criticized the general scale of gas charges, and urged that no gas ought to be supplied by the Corporation to any consumer at less (to say the least) than its net cost price, because if this were done it meant that the other consumers had to pay more than they ought in order to balance the loss. The Gas Department for years had been using revenue for what should have been capital expenditure; and as a result the consumers of gas had to pay more than they should be paying.

Mr. THACKER, who is a master gasfitter, supported the amendment. He served his apprenticeship with the Gas Department, and knew there were many ways in which economies could be effected. He wondered, for instance, why gas fires and cookers were fixed free of charge. There were other services rendered free. For clearing the house pipes a charge of 2s. 6d. was made for work that must cost on an average about 10s. to 12s., and in some cases as much as £2.

Alderman LLOYD, in reply, said the Gas Department in the past fifty years had benefited the city to the extent of £2,000,000. Birmingham was not the only place where they had had a bad time. No gas was being sold below cost except for public lighting, and thereby the Gas Department saved the city £24,000 a year—a penny rate.

The amendment was carried.

THE DEPARTMENT'S JUBILEE.

Alderman LLOYD, in moving the adoption of the report as amended, said one gratifying feature of the accounts was the increase in the consumption of gas of 5·35 p.ct. During the year 810,000 tons of coal had been carbonized, as compared with 799,000 tons in the previous year; and 1,735,000 gallons of gas oil had been used in the manufacture of carburetted water gas, as compared with 2,133,000 gallons. The total quantity of gas sold was 12,659 million c.ft., and was a record. The remarkable demand for apparatus of all kinds, both for domestic and industrial use, still continued, and indicated that, unless the unfortunate necessity for increasing the price had a deterrent effect, there was likely to be an even greater consumption of gas during the ensuing year. This was the fiftieth anniversary of the acquisition of the gas undertaking by the Corporation, and undoubtedly the City Council must be gratified with the size and importance it had assumed, and the ever-increasing service it was rendering to the community. Theirs was the largest provincial gas undertaking in the United Kingdom. In all probability a recommendation would be submitted at a future meeting of the Council for an application to be made to the Board of Trade for an Order involving a charge for gas by the therm.

The report as amended was approved.

MALTA AND MEDITERRANEAN GAS COMPANY, LTD.

A Satisfactory Statement.

The Ordinary General Meeting of the Company was held on Tuesday of last week, at the London Offices, Nos. 59 and 60, Gracechurch Street, E.C.—Mr. A. M. PADDON (the Chairman) presiding.

The SECRETARY (Mr. C. J. Daun) read the notice convening the meeting and the Auditors' certificate; and the Directors' report and the statement of accounts were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said the shareholders would have seen that there was nothing but what was of a strictly formal character in the report itself. All matters of ancillary concern were in the accounts, and a remarkable feature of these accounts subsisted in their very close resemblance to those of twelve months ago. In certain respects they were more favourable, because a year ago the figures were based upon a price of gas as between 8s. 6d. and 7s. 10d. per 1000 c.ft., whereas to-day the results were built up on charges ranging from 7s. 10d. to 7s. 6d. per 1000 c.ft.—in other words, a difference of 1s. per 1000 c.ft. This, of course, must have its immediate effect upon the amount received for gas; and this figure had decreased—as he said, necessarily—by £1858. Now, the amount of gas sold, within a small fraction, was exactly the same as that sold twelve months ago; but, notwithstanding this, there had been a gain under the head of receipts from residuals of £400 odd out of the depleted amount he had mentioned; and from fittings, meters, and other subordinate charges another £400 had been accreted. So that the falling off of £1800 was reduced by these additions to something approximating £1000. One of the most gratifying features of the present statement was that the unaccounted-for gas had been reduced by nearly 3 p.ct. One of the proprietors had made complaint of this twelve months ago; and an assurance was then given him that the matter was receiving the attention of the Board and officers. This process was being continued, so that at the present moment the unaccounted-for gas, notwithstanding exceptional disabilities at Malta, was not much higher than would be the case in this country with an undertaking of similar size. As a matter of fact, the figure was down to under 10 p.ct.; and considering the scattered nature of the district, and the way in which the supply per mile of main had been reduced by the very keen electrical competition to which the Company were subjected, he did not think the proprietors could look for the percentage to be very much less than the figure which had now been attained, though endeavours would be unremitting to reduce it still further. Of course, a very much better criterion of the real nature of the working than this was the amount of gas sold per ton of coal carbonized. The percentage of unaccounted-for gas must in a sense be an estimated figure; but when they took the sale of gas per ton, they got to something absolutely final, and this stood at a highly creditable figure in the accounts. On the debit side of the statement, coal had cost them £1574 less, and manufacturing charges had been reduced by nearly £100; but they had expended a little more lavishly upon maintenance of works, which was increased by some £1600. There had been a reduction of over £300 in the appropriation for corporation profits tax, which now figured at £110. He thought this was rather a matter of technical accountancy, because it should have disappeared, and would inevitably disappear from the next account. Turning to the general balance-sheet, it would be seen that the amount available was adequate to meet all their requirements.

A SOUND FINANCIAL POSITION.

On the credit side, investments (which covered the amortizement account, the reserve account, and the general investment account) had been split-up and appropriated to their particular purposes. Thus it was a very different statement from what would be the case were the investments simply aggregated. Whereas the book value of these investments was £56,000, the actual value at the date of the accounts was £61,364—nearly £7000 more than a year ago. If they would compare this £61,000 odd with the debit statement on the opposite side, which showed the total capital liabilities to be £123,000, they would realize how very sound the financial position of the Company was becoming, because it was tantamount to saying that one-half of the capital had been written off. The amortizement account was increased by £1607, and the reserve account (by interest and by the appropriation mentioned in the report) was increased by £4485. After this procedure had been carried out, and allowance had been made for the interim dividend, the amount standing at credit of profit and loss account was £13,704, which was £506 more than a year ago. This was the final figure of the whole account; and he thought the proprietors would agree with him that it was a very satisfactory statement to be able to present. He had told them at the last meeting that the Board thought the Company could get an increase in their business. Everything at that time pointed in this direction; and it was not the fault of the business that it had not so increased. Just, however, as they had got fairly into the middle of the account, the Egyptians started one of their political movements, and the Fleet had to go to there with a considerable proportion of the garrison. When the Fleet moved away from Malta, it meant that 30,000 people left the Company's area of supply; and considering the size of the undertaking, this was a very disturbing factor. But all they could do was to wait for them to come back again, and they had come back. As a result, so far during the current financial year the increase in the Company's business had been something like 10 p.ct.; and he did not see why this state of affairs should not continue, because their Engineer and General Manager had reported that, for the first time for many years—not only since the war, but before it—building activities were manifesting themselves in Malta. Therefore the Engineer considered that the prospects of the undertaking were distinctly more favourable than he had hitherto known them to be. They had not much to fear from electrical competition, because they had had it for the last thirty years; and in Malta (which was essentially a Government settlement) the production and sale of electricity were in the hands of the Government. Therefore there was not much to suffer from electrical competition beyond what they had already suffered. In this country there was evidence of some disturbance in the minds of gas investors with regard to the Govern-

ment and electricity; but he thought it did not bode particularly well for an industry when the Government took a hand in it. He did not believe that those who formed the fanciful ideas of which one now heard would translate their expectations into tangible results.

Mr. A. W. OKE seconded the motion, which was carried unanimously without discussion.

The CHAIRMAN next moved: "That a dividend of 3¼ p.ct. (making, with the interim dividend paid in December last, 6 p.ct. for the year), free of income-tax, be declared on the ordinary shares, and dividends of 3½ p.ct. and 3¾ p.ct., less income-tax, be declared on the first and second preference shares respectively."

Mr. STRACHAN C. CLARKE seconded the proposition, which was agreed to.

The retiring Director (Mr. E. L. Burton, F.S.A.A.) was re-elected, on the proposition of the CHAIRMAN, seconded by Mr. F. R. SMITH; and the Auditors (Messrs. William Cash, F.C.A., and Mr. Hyde C. Burton, A.C.A.) were similarly reappointed, on the motion of Mr. SMITH, seconded by Mr. F. W. CHURCH.

Mr. W. H. DODGSON said he was assured of the support of all the proprietors in proposing a hearty vote of thanks to the Chairman, Directors, and officers of the Company for their services during the past year. The results recorded were most excellent; and he was glad to hear that the Company's prospects were still favourable.

Mr. CHURCH seconded the proposition, which was heartily agreed to.

The CHAIRMAN, acknowledging the vote, remarked that the strength of the undertaking really depended upon the excellence of the working results. Personally, with an extensive experience of gas undertakings, he had never known better working results than those which came in month by month from their Malta Station. The efforts of the Board and the officers would be directed towards the maintenance of these results.

GAS DEVELOPMENT AT NANTWICH.

The coming-of-age of the Nantwich gas undertaking as a publicly-owned concern was celebrated by the installation of an important new carbonizing plant, which, on June 17, was inspected by about sixty visitors, who were afterwards entertained to luncheon.

Assembling at the works, the visitors were welcomed by Mr. James Bowyer, Chairman of the Council, and Mr. A. Rollings, Chairman of the Gas and Lighting Committee, who expressed the hope that the inauguration of the latest plant would mark the commencement of a new era of success for the undertaking.

The retort bench consists of four through beds of 24 in. by 16 in. D-section retorts 16 ft. long. The settings are of Gibbons and Masters' latest tube regenerative pattern, with the Sydenham grate. A separate house has been built for a 25-KW. gas-engine driven electrical generator. The plant has an approximate gas-making capacity of 350,000 c.ft. per day.

Luncheon was served at the Brine Baths Hotel, where Mr. James Bowyer presided. He was supported by Mr. A. Rollings (Chairman of the Gas Committee) and Mr. A. Mackay (Chief Gas Engineer for Stoke-on-Trent).

Mr. A. MACKAY proposed the toast of "The Nantwich Urban District Council and the Gas Undertaking," and heartily congratulated the Council upon their progressive step. He complimented Mr. Vernon (the Manager of the works) on the work he had carried through in preparing the scheme, and said the ratepayers should be grateful to the Council for having taken a step which would lead to a cheapening of the gas supply.

Mr. A. ROLLINGS, in response, traced the history of the gas undertaking in Nantwich, and mentioned that the total cost to date, including the new plant and working capital, was £100,600. During the time the ratepayers had been the owners, £35,783 had been paid off, leaving a balance of £64,817; and the prospect for the undertaking was now considerably brighter. He announced that the Gas Committee had decided upon a reduction in the price of gas. Basing his estimate on last year's consumption, he said the total saving to consumers would be about £1700 a year.

Mr. C. S. BENNETT, replying to the tribute paid to the contractors, said he was convinced that the town would reap great benefits from bringing their works up to date. The work could not have been carried through so well but for the co-operation of Mr. Vernon.

TRADE NOTES.

Spencer-Bonecourt Kirke Boilers and Superheaters.

Messrs. Spencer-Bonecourt, Ltd., of London and Hitchin, have brought out an enlarged second edition of their catalogue of the Kirke boiler, which will doubtless be of interest to many readers of the "JOURNAL."

Gas-Works Plant.

The Koppers Coke Oven Company, Ltd., of No. 301, Glossop Road, Sheffield, have published a booklet in which they describe the gas plant which they manufacture. It is an excellent publication, and will prove of value to gas engineers.

The "Mainstay" Cooker.

Messrs. R. & A. Main, Ltd., of London and Falkirk, have published a very interesting booklet entitled "The Story of the Mainstay Cooker." Both the illustrations and the text have been excellently prepared; and the publication as a whole does credit to the firm.

Smoke-Consuming Door.

Messrs. Meldrums, Ltd., of Timperley, have brought out a smoke-consuming door to take the place of the ordinary firing door fitted on vertical and Cochran boilers. It consists of a double-walled door having steam jets over and along a top opening. These jets deliver secondary air down and through the inside of the door just at the point of combustion. The jets need only be in operation for a half to one minute after a fresh charge of fuel.

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

Although present indications are pointing to the serious possibility of trouble and stoppages in the coal trade, there is a general feeling of relief that at any rate a crisis is approaching of the present situation, which has become quite hopeless. Pits have, for some considerable time, been closing on all sides, and still the demand is far from adequate to meet the supplies available from those collieries which are struggling on, and it has long been obvious that, except for something quite unexpected turning up, no improvement could be looked for on the basis of present costs.

It is to be hoped that the uncertainty will not last long, and that something definite will speedily be evolved to put an end to the present position, which is intolerable alike to owners and men.

In the meantime, judging from previous experience, there is more than likely to be some stiffening in the demand, though stocks on every hand are reported to be so high that it can hardly be expected to be of much account. This week is the great annual Newcastle Race Week holiday, and the Exchange will be closed half-days each day.

Closing quotations for gas coals were nominally 18s. 9d. f.o.b. for Wear Specials, and 18s. for best qualities. Seconds were 15s. 6d., but at these prices were probably discountable for prompt and definite business. Coking makes were very weak, and best Durham bunkers were obtainable at 16s. 3d.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

Collieries are not inclined to yield to the pressure of those gas engineers who have withheld their contracts till the last moment in the hope of getting yet larger concessions. Business has been done at 3s., and in some cases 3s. 6d., below the old contract rates; lower than this the collieries will not go. There is little change to record in the general market position. Smalls have firmed up to the extent of about 6d. as a consequence of the drastic reduction of output which has been effected. Demand continues to decrease, and values can only be steadied by making a corresponding readjustment of supplies. The expiration of the agreement between the owners and the miners is apathetically awaited. So far as the gas undertakings are concerned they probably never had larger reserves. Stocks in other directions are considerable having regard to the slow rate of consumption.

Industrialists who have accommodation for stacking fuel are generally well insured against contingencies. Those who need to replenish every week or fortnight betray no anxiety as to the continuity of supplies. Nobody believes a national hold-up is imminent. The calmness of the market has been undisturbed throughout the protracted negotiations on the labour question. What most industrialists feel is that, if the cost of coal cannot be stabilized on a substantially lower basis than has prevailed till recently, it does not matter very much what happens: a trade revival is not to be hoped for, and many of the works may as well be closed as kept going in the unprofitable conditions to which they have been reduced.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

There is a great deal of uncertainty in regard to the future prospects of the coal trade by reason of the fact that present prices do not warrant collieries producing the lower grade fuels continuing operations. What effect this will have on the prices of available supplies remains to be seen. So far, the negotiations between the owners and the miners have not led to any enlightenment.

Gas coals are moving spasmodically with no standardized rates for forward delivery, and contracts are being fixed up at varying rates in accordance with local circumstances. The possibility of a strike may lead to a shortening of the market, but any stoppage will not be of such a prolonged nature as to inconvenience the consumers.

House coals are moving slowly, while industrially there is no improvement in the demand; so that as a result fuels for prompt delivery are available at discounted rates. There is no improvement in the export section. In Lancashire there is a moderate demand for industrial coal. Prices are unchanged; but there is a good deal of outside slack coming in at from 10s. to 12s. per ton. For high-class Lancashire slacks from 15s. to 16s. at the pits is asked.

Hull prices at the week-end were: South Yorkshire.—Hards, Association, 19s. 3d. to 19s. 6d.; screened gas coal, 16s. 6d. to 17s. 6d.; washed trebles, 17s. to 17s. 6d.; washed doubles, 16s. to 16s. 6d.; washed singles, 15s.; washed smalls, 11s.; unwashed doubles, 15s.; rough slack, 10s.; smithy peas, 16s. 6d. to 18s. 6d. West Yorkshire.—Hartleys, 15s. to 17s.; screened gas coal, 16s.; washed trebles, 16s. 6d. to 17s.; washed doubles, 14s. 6d. to 15s.; washed singles, 13s. 6d. to 14s.; washed smalls, 10s. to 11s.; unwashed trebles, 15s.; unwashed doubles, 12s. to 13s.; rough slack, 9s. 6d.; coking smalls, 9s. to 10s. Derbyshire and Notts.—Top hards, 19s. 3d. to 20s.; washed trebles, 17s. to 17s. 6d.; washed doubles, 15s.; washed singles, 14s.; washed smalls, 9s. 6d.; unwashed doubles, 13s. 6d. to 14s. 6d.; rough slack, 9s. 3d. to 9s. 9d. Yorkshire, Derby, and Notts.—Screened steam coal, 15s. to 16s.; gas coke, 19s. to 20s.; furnace coke, 17s. per ton.

James Keith & Blackman.—The Directors in their report state that the amount of business done during the year to March 31 last was greater than that of the previous year. After providing for debenture interest, preference dividend, and making sufficient allowance for depreciation and reserves against doubtful debts, the accounts show an available balance of £31,638. The Directors recommend a dividend on the ordinary shares of 10 p.ct., less tax, and the transfer to reserve of £5000, carrying forward £11,138.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *June 22.*

The position of pitch continues unchanged, and the price remains nominal at about 41s. to 42s. per ton.

In the meantime, the demand for road tar continues unabated; most makers being exceedingly busy with orders.

Creosote is steady and unchanged at about 7d. per gallon net, in bulk.

Solvent naphtha is in short supply at about 1s. 8d. per gallon for 95/160 quality.

Pure benzole and pure toluole are firm at 1s. 11d. to 2s. per gallon.

Tar Products in the Provinces.

June 22.

There is little fresh to report concerning the markets for tar products.

In pitch there have been a few inquiries during the past week, but little business is reported.

Creosote appears to be steady.

Benzoles and solvent naphtha are in fair demand.

In crude carbolic one or two sales are reported at low prices.

The average values for gas-works products during last week were: Gas-works coal-tar, 26s. to 31s. Pitch, East Coast, 39s. to 40s. f.o.b. West Coast—Manchester, 34s. to 35s.; Liverpool, 35s. to 36s.; Clyde, 38s. to 39s.; Benzole, 90 p.ct., North, 1s. 7½d. to 1s. 8½d.; crude, 65 p.ct. at 120° C., 1s. to 1s. 1d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 7½d. to 1s. 8½d. Toluole, naked, North, 1s. 6½d. to 1s. 7½d. nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8½d. Solvent naphtha, naked, North, 1s. 5d. to 1s. 6d. Heavy naphtha, North, 1s. to 1s. 2d. Creosote, in bulk, North, liquid, 5⅝d. to 6d.; salty, 5⅝d. to 5⅞d.; Scotland, 5½d. to 5⅝d. Heavy oils, in bulk, North, 6½d. to 7d. Carbolic acid, 1s. 5d. to 1s. 6d. prompt. Naphthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality unsaleable.

At a meeting of the Council of the Midland Branch of the National Union of Manufacturers at Birmingham last week, concern was expressed at the proposed raising of the price of gas in the city. One local firm wrote that a rise of 3d. to 4d. per 1000 c.ft. would cost them from £300 to £400 per year extra. It was agreed to write to the Lord Mayor calling attention to the fact that the rise might induce certain manufacturers and large consumers to put down their own gas-producing plant, in which case the price would have to be raised to the general public, and asking whether some differentiation in the price could not be made in favour of large consumers and manufacturers.

CONTRACTS OPEN.

Coal.

The Haverhill Urban District Council are inviting tenders for the supply of 1500 tons of best gas coal. [See advert. on p. 1038.]

The Urban District Council of Colwyn Bay and Colwyn are inviting tenders for the supply of coal for gas making purposes. [See advert. on p. 1038.]

The Gas Committee of the Borough of Clitheroe are inviting tenders for the supply of 8000 tons of gas nuts, unscreened coal, and rough dry slack. [See advert. on p. 1038.]

Excavating, Laying, and Reinstating Pipes.

Tenders are invited by the Lancaster Corporation Gas Department for excavating, laying, and reinstating 1500 yards of 18-in. gas-mains. [See advert. on p. 1038.]

Pipes (Steam and Gas).

The Town Council of Middleton are inviting tenders for cast iron socket and spigot pipes and wrought iron steam tubes and fittings. [See advert. on p. 1038.]

Gas Week in Kendal.—The Kendal Corporation Gas and Water Department are to be congratulated on the excellent exhibition which they are holding this week in the Town Hall, Kendal. Opened on Monday last by Alderman J. J. Thomas, J.P. (the Chairman of the Gas and Water Committee), the exhibition is attracting a large number of visitors. Richmond's popular "Bungalow" and "Ranelagh" cookers are conspicuous among a wide selection of cooking, water heating, and heating equipment manufactured by the Richmond Gas Stove and Meter Company, Ltd., and supplied by the Corporation on special cash and hire-purchase terms. No charge is being made for fixing. Cookery lectures and demonstrations are being given each afternoon and evening.

Successful Year at Hinckley.—The Hinckley Gas-Works last year made a net profit of £3092, besides reducing the price of gas by 4d. per 1000 c.ft. "The working results were never better, and constituted a record in every respect," said Mr. F. Burton (the Chairman of the Committee) in presenting the statement of accounts for the year ended March 31. While the cost of coal and wages (which represented 83 p.ct. of the working expenses) was over 100 p.ct. higher than in 1913, the average price charged for gas was only 33 p.ct. more. The gas sold was 164,777,700 c.ft., as compared with 155,270,400 c.ft. in the previous year; while the quantity unaccounted for was only 1·44 p.ct.—the lowest figure on record, except in 1913, when it was 1·4 p.ct. Mr. Bott said that the Council and the town had reason to congratulate themselves when they read of neighbouring towns being faced with an increase in the price of gas. Thanks were due to their Manager (Mr. Fred Lee). The Chairman (Mr. Hurst) commented upon the energy and foresight of the Manager, who was accorded a vote of thanks.

GAS REGULATION ACT, 1920.

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Gas Exhibition at Denton.

The advantages of cooking by gas were ably demonstrated last week at Denton, where an extremely well-arranged exhibition was held in the Co-Operative Hall, Ashton Road. People who still cling to the use of the coal range for cooking and water heating responded to the Gas Department's invitation in large numbers, while others whose gas equipment is out-of-date or insufficient for growing needs also evinced a gratifying interest. The exhibition was arranged by the Denton Urban District Council Gas Department; and prominent on the stand were Richmond's popular "Bungalow" cookers, as well as Wilsons & Mathiesons' cookers and their famous "Sunbeam" gas grates. A very complete and comprehensive display of apparatus which may be had on special cash or hire-purchase terms was tastefully set-out; and many of the appliances were shown fitted and in operation. Cookery lectures were given each afternoon and evening throughout the period of the exhibition, from June 15 to 19. These lectures and practical demonstrations proved a very popular feature of this "Gas Week" in Denton.

Eastbourne Gas Company's Loan Capital.—We understand that the £50,000 of 5 p.ct. debenture stock in the Eastbourne Gas Company recently advertised in our columns was fully subscribed, and that several of those who tendered at the minimum price of £95 p.ct. failed to obtain a full allotment. We are informed that the average price realized was £96 10s. p.ct.

Barrow Gas Undertaking.—At a meeting of the Barrow Town Council on Monday, June 8, Alderman R. Thompson, Chairman of the Gas and Water Committee, gave the annual statement upon the working of the undertaking, which, he pointed out, had a capital account of three-quarters of a million. There had been an increase in the quantity of gas sold of 19,932,000 c.ft., equal to 7 p.ct.; the total quantity sold being 303,907,000 c.ft. The number of gas cooking stoves in use at the end of the financial year was 101 in excess of the previous year; the total now being 10,324. The report was unanimously approved; and in reply to a question, Alderman Thompson said that gas would be supplied to the residents in Vickerstown, Walney Island, as soon as the necessary arrangements had been completed.

Torquay Gas Company's Carbonizing Plant.—Major R. P. Kitson presided last Wednesday at an extraordinary meeting of the Torquay and Paignton Gas Company, when the Directors sought sanction to create and issue debenture stock to the amount of £53,310. The Chairman explained that the money was primarily required in connection with the erection of vertical retorts in place of the horizontal settings. By reason of the amalgamation of Paignton with Torquay, it had been decided to discontinue the manufacture of gas at the Paignton works, and to instal larger carbonizing plant at the Torquay works. The Company would not only obtain increased results, but the installation of vertical retorts would improve the amenities of the neighbourhood. The progress of the Company continued to give great satisfaction to the Directors; the reports being always of increased consumption. The shareholders sanctioned the Directors' proposals.

Truro Gas Company and Electricity.—The Truro Corporation, who had an electricity scheme of their own under consideration for a long while, and finally rejected it, have had a number of offers from private undertakings to supply the city with electricity. Several of these were placed before the Town Council last week, when it was decided to refer them to the Electric Lighting Committee. One of the offers was from the Truro Gas Company. This was to provide electricity within six months of obtaining the necessary authority, with power to the Corporation to purchase the undertaking, if they desired, after seven years. The price to be charged for lighting purposes would be 10d. per unit, and for power 5d. per unit, with authority to allow discount for large consumption or for current used for special purposes. They stated that the only hope for an economic supply was for it to be generated and distributed by the existing gas undertaking. Mr. E. J. Larch (the Chairman of the Electric Light Committee) said the Gas Company's offer was reasonable, but they should consider whether the general position had altered since 1913, when they fought the Gas Company over the Provisional Order.

The Burnley Gas Engineer (Mr. J. H. Clegg) has been authorized to visit the Continent for the purpose of inspecting in operation a Sulzer plant for the dry cooling of coke.

Blackpool Gas-Works report an increase for the four weeks ended June 17, the output being over 69⅛ million c.ft.—an increase of 4⅜ millions on last year. The increase is equivalent to 7·31 p.ct. During May, 133 new gas consumers were connected.

In connection with the proposed purchase of the local gas undertaking, the Towyn Urban District Council are appointing a gas expert who will make a full report upon the plant, mains, &c., of the Dysynni Gas Company at Towyn and Aberdovey, and prepare a valuation of the plant, machinery, &c.

Presentations followed presentations at a meeting of the members of the Luton Gas Company's First Aid Class on Wednesday last, the distribution of certificates, vouchers, and medallions awarded on the recent examination being followed by gifts of a different kind. Mr. William Phillips (the Secretary and Manager of the Company) presided, and the awards were presented by Mrs. Phillips. All the 21 entrants were successful, 2 receiving first-class certificates, 5 second-year vouchers, and the remaining 14 medallions which signified that they were fully efficient in first-aid work. Mrs. Phillips was also called on to make a presentation of a calendar to Dr. Archibald, in recognition of his services during the past three years. The Class Secretary (Mr. L. Scrivener) and the Instructor (Mr. F. Hucklesby) were given a silver rose bowl and tobacco pouch respectively. The presentation of a cheque for £2 2s. from the Gas Company to the local brigade of the St. John Ambulance Corps was also made.

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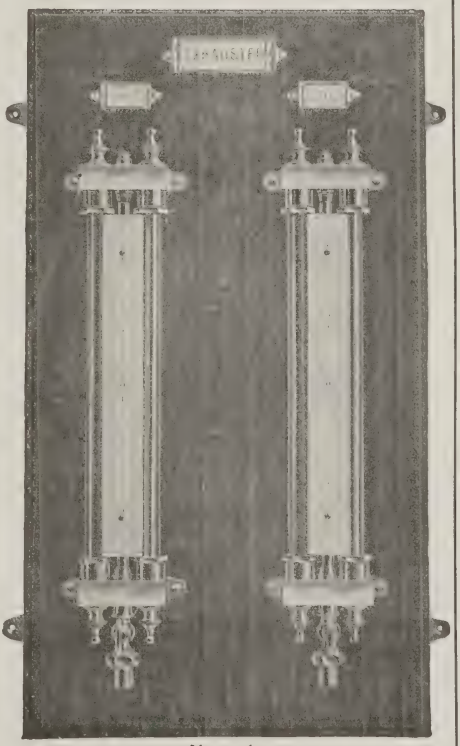

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STOCK MARKET REPORT.

THE Stock Markets last week were uncertain, the conditions of the industrial and financial circles doubtless contributing thereto. The position is not likely to be improved by the new issues announcements of the current week, which totalled to the sum of over £6,000,000, the principal of which is the Union Cold Storage issue of £3,220,000 6 p.ct. preference shares. Prices, especially of gilt-edged stocks, continued to fall, and interest displayed in any one section was speedily dissipated by a volume of sellers.

Home Rails, however, exhibited a distinct change for the better on the more hopeful reports with regard to the labour problems. Great Western, Midland and Scottish, North Eastern, and Southern stocks improved from 3 to 5 points. Industrials, on the other hand, were more varied. Reports from the different centres show that although there is a good deal of disorganization and uncertainty in some industries, others are doing exceptionally well, as for instance the artificial silk industry. Tobaccos were reactionary, and Rubbers slowed-up on profit-taking sales.

There was a normal number of transactions in the Gas Market, and the changes in the quotations were unimportant. The Sheffield three stocks were marked up 1 point; but British ordinary and Liverpool ordinary fell 1 and 1¼ points respectively. It will be noticed that the Bombay £5 shares, which have been split-up into £1 shares, are now quoted in the list at an average of par. This adjustment of the face value will probably bring about an improvement in the market value of the shares, which on an 8 p.ct. dividend are an attractive investment.

The following transactions were recorded during the week.

On Monday, Bombay 5, 5¼, Bournemouth "B" 12$\frac{9}{16}$, 12$\frac{11}{16}$, 3 p.ct. debenture 58$\frac{3}{4}$, Brentford "A" 95, Brighton and Hove "A" 124½, 125, British 110, Commercial 3½ p.ct. 86, Continental Union 7 p.ct. preference 87$\frac{3}{4}$ *ex* div., European 7$\frac{3}{8}$, Gas Light and Coke 83$\frac{1}{2}$, 83$\frac{3}{8}$, 83$\frac{3}{4}$, 84, 84$\frac{1}{4}$, 3$\frac{3}{4}$ p.ct. maximum 62, 62$\frac{1}{2}$d. 4 p.ct. preference 78$\frac{1}{4}$, 78$\frac{3}{4}$, 79, 3 p.ct. debenture 59$\frac{1}{2}$ *ex* div., Imperial Continental 145$\frac{1}{2}$, 146, 147$\frac{1}{2}$, Lea Bridge 98, Malta and Mediterranean 88s. 9d., 91s. 3d., Montevideo 67, 67$\frac{1}{2}$ *ex* div., Plymouth and Stonehouse 111, Primitiva 8s. 9d., 9s., 9s. 3d., 9s. 4½d., South Metropolitan 93½, 93$\frac{7}{8}$, 94, 3 p.ct. debenture 59$\frac{1}{8}$, 61, South Suburban 5 p.ct. 94, 96, 5 p.ct. debenture 98½, Wandsworth (Wimbledon Stock) 105. Supplementary prices, Bath 5 p.ct. debenture 95$\frac{1}{2}$.

On Tuesday, Alliance and Dublin 65, Brentford 5 p.ct. preference 95, Gas Light and Coke 83½, 83$\frac{3}{4}$, 84, 84$\frac{1}{4}$, 3 p.ct. debenture 50$\frac{1}{2}$, 59$\frac{3}{8}$ *ex* div., Imperial Continental 145, 145$\frac{1}{4}$, 145$\frac{3}{4}$, 146$\frac{1}{2}$, Montevideo 67 *ex* div., Portsea Island "C" 97$\frac{1}{2}$, 98, "D" and "E" 80$\frac{1}{2}$, 81, Primitiva 9s., 9s. 6d., South Metropolitan 94$\frac{3}{4}$. Supplementary prices, Sunderland 6 p.ct. maximum 104$\frac{1}{2}$.

On Wednesday, Alliance and Dublin 65, 65$\frac{1}{2}$, Cardiff 104, European 7$\frac{1}{16}$, 7$\frac{1}{8}$, Gas Light and Coke 83½, 83$\frac{3}{4}$, 84. Imperial Continental 145. Montevideo 68 *ex* div., Oriental 104, 104$\frac{1}{2}$, 104$\frac{3}{4}$, Primitiva 9s. 4$\frac{3}{4}$d., 9s. 9d., 9s. 10$\frac{3}{4}$d., 4 p.ct. (River Plate) debenture 66$\frac{1}{4}$, 66$\frac{3}{4}$, South Suburban 5 p.ct. 94, 95, Tottenham 5$\frac{3}{8}$ p.ct. preference 104$\frac{1}{2}$. Supplementary prices, British Norwich 3$\frac{1}{2}$ p.ct. mortgage debentures 63$\frac{1}{2}$.

On Thursday, Continental Union 35, Gas Light and Coke 83$\frac{3}{8}$, 83$\frac{1}{2}$, 83$\frac{5}{8}$, 84, 84$\frac{1}{4}$, 3$\frac{1}{2}$ p.ct. maximum 62, Hastings and St. Leonards 5 p.ct. converted 95, 95$\frac{3}{4}$, Imperial Continental 144, North Middlesex 118, Primitiva 9s. 6d., 9s. 10$\frac{1}{2}$d., 10s., South Metropolitan 93$\frac{1}{2}$, 93$\frac{3}{4}$, 93$\frac{7}{8}$, 6$\frac{1}{2}$ p.ct. debenture 103, 103$\frac{1}{2}$, Swansea 7 p.ct. preference 103$\frac{1}{2}$. Supplementary prices, Barnet "C" 147$\frac{1}{2}$, East Grinstead "A" 12$\frac{3}{4}$, 13, Mid-Kent 54$\frac{3}{4}$.

On Friday, Alliance and Dublin 65, Commercial 86, 86$\frac{1}{2}$, Gas Light and Coke 83$\frac{1}{2}$, 84, 84$\frac{1}{4}$, 4 p.ct. preference 78$\frac{3}{4}$, Montevideo 67$\frac{1}{2}$ *ex* div., Oriental 103, Primitiva 10s., South Metropolitan 93$\frac{1}{2}$, 94, 94$\frac{1}{4}$, 94$\frac{3}{4}$, Tottenham "B" 94, 96. Supplementary prices, Barnet "B" 145.

Financiers are still in doubt about the ultimate effect of the restoration of the Gold Standard. So far, with no increase in the Bank Rate and an increase in the stock of gold, all appears to have gone well. During the past week money was in plentiful supply. Over the week-end the rate for loans was 3$\frac{3}{4}$ p.ct., but old day-to-day loans were renewed at 3½ p.ct. The result of the Treasury Bill allotment showed a rise of nearly 5d., to £4 8s. 3·35d. p.ct.

The feature of the Foreign Exchange Market was the inexplicable slump in the Italian exchange; but assisted by New York buying at the end of the week, the rate recovered slightly, and finally closed at 129 lire. The Paris cheque displayed more firmness and closed at 102.62½, and Belgian francs at 103.90. Sterling on New York rose slightly to 4.86.

The Silver Market was very quiet, and the price for cash—31½d. per oz.—was unaltered. Gold remained firm at 84s. 11½d. per oz.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on March 5. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3½ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. June 19.	Rise + or Fall − on Week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 5	5	5	Aldershot 5 p.c. max. C. .	78—81	..	..
295,492	,,	,,	4	4	Do. 4 p.c. Pref. . .	77—76	..	..
1,551,868	,,	Apl. 2	6¼	6¼	Alliance & Dublin Ord. .	65—70	..	65—65¾
374,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb. .	63—68	..	..
300,000	1	May 7	1/7½	1/7½	Bombay, Ltd.	1$\frac{5}{16}$—1$\frac{3}{8}$	..	..
170,000	10	Mar. 5	8½	8½	Bournemouth 5 p.c. . .	12—13	..	..
425,050	10	,,	7	7	Do. B 7 p.c.. .	12¾—12¾	..	12$\frac{11}{16}$—12$\frac{13}{16}$
150,000	10	,,	6	6	Do. Pref. 6 p.c..	11—12	..	..
50,000	Stk.	Jan. 8	3	3	Do. 3 p.c. Deb..	35—59	..	58¾
162,025	,,	,,	4	4	Do. 4 p.c. Deb..	78—82	..	..
992,045	,,	Mar. 5	6$\frac{1}{16}$	6$\frac{1}{16}$	Brentford A Con. . . .	95—100	..	95
900,500	,,	,,	6¾	6¾	Do. B New . . .	95—100	..	..
76,000	,,	,,	5	5	Do. 5 p.c. Pref. . .	95—98	..	95
306,690	,,	June 11	4	4	Do. 4 p.c. Deb. . .	75—80*	..	..
181,337	,,	,,	6	6	Do. 6 p.c. Rich. Red. Deb.	100—105*	..	..
214,740	,,	Mar. 5	11¼	12½	Brighton & Hove Orig. .	165—170	..	..
244,200	,,	,,	8¾	9½	Do. A Ord. .	122—125	..	124½—125
1,287,500	,,	Feb. 19	4	5	Bristol 5 p.c. max. . .	96½—97½	..	..
855,000	,,	Mar. 19	8	7	British Ord.	109—114	—1	110
100,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref. . .	123—128	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. .	72—77	..	..
100,000	10	May 21	6	8	Cape Town, Ltd. . . .	6¼—7½	..	..
100,000	10	Apl. 23	4½	4½	Do. 4½ p.c. Pref.. .	6—7	..	..
150,000	Stk.	Dec. 18	4½	4½	Do. 4½ p.c. Deb.. .	71—76	..	..
626,860	,,	Feb. 19	6	6	Cardiff Con. Ord. . . .	101—104	..	104
237,860	,,	Jan. 8	7½	7½	Do. 7½ p.c. Red. Deb. .	104—107	..	..
157,150	,,	Feb. 19	5	6½	Chester 5 p.c. Ord. . . .	89½—94½	..	..
1,513,280	,,	Mar. 5	6	5/14/8	Commercial 4 p.c. Cap. .	86—89	..	86—86½
560,000	,,	,,	6	5⅜	Do. 3½ p.c. Cap. .	86—89	..	86
475,000	,,	June 11	3	3	Do. 3 p.c. Deb. .	56—59*	..	..
800,000	,,	14 Jan. 15	—	—	Continental Union, Ltd. .	34—39	—1	35
200,000	,,	June 11	7	7	Do. 7 p.c. Pref. .	85—89*	..	87½
660,000	,,	Mar. 5	6½	6½	Croydon sliding scale . .	98—102	..	..
284,975	,,	,,	5	5	Do. max. div. . . .	83—86	..	..
492,270	,,	Feb. 19	6	9	Derby Con.	110—112*	..	..
55,000	,,	Jan. 8	4	4	Do. Deb.	74—76*	..	..
1,002,180	1	Jan. 22	6	4	European, Ltd.	6¾—7¾	..	7¼—7¾
16,460,070	Stk.	Feb. 19	5½	5½	Gas Light & Coke 4 p.c. Ord.	83—85	..	83¾—84¼
2,600,000	,,	,,	3¾	3¾	Do. 3½ p.c. max. .	62—65	..	62—62¾
4,062,235	,,	,,	4	4	Do. 4 p.c. Con. Pref.	78—80	..	78¾—79
4,761,930	,,	June 11	3	3	Do. 3 p.c. Deb. . .	58—61*	..	59¼—59¾
130,000	,,	—	10	10	Do. 10 p.c. Bonds . .	..	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Mar. 19	6¾	6¾	Hastings & St. L. 5 p.c. Conv.	92—97	..	95—95¼
258,740	,,	,,	5¼	5¼	Do. 3½ p.c. Conv.	73—78	..	..
70,000	10	May 7	10	10	Hongkong & China, Ltd. .	17—18	..	..
86,600	Stk.	Mar. 5	10	10	Hornsey 7 p.c.	135—141	..	..
1,976,000	,,	May 21	10	59	Imperial Continental Cap. .	144—149	—1	144—147¾
263,950	,,	Feb. 5	3¼	3¼	Do. 3½ p.c. Red. Deb.	71—74	..	..
235,242	,,	Mar. 19	6¼	6¼	Lea Bridge 5 p.c. Ord.. .	96—101	..	98
8,127,340	,,	Feb. 19	5¼	5¼	Liverpool 5 p.c. Ord. . .	86—87½	—1¼	..
600,000	,,	Mar. 19	7	7	Do. 7 p.c. Red. Pref.	100¾—104½	..	..
165,736	,,	Feb. 19	9	8	Maidstone 5 p.c. Cap. . .	122—132	..	..
63,480	,,	Dec. 18	3	3	Do. 3 p.c. Deb.. .	53—58	..	..
75,000	5	Dec. 4	7	5	Malta & Mediterranean .	4¼—4¾	..	88/9—91/3
541,920	Stk.	June 11	4	4	Montevideo, Ltd. . . .	65—69*	+1	67—68
2,061,315	,,	Mar. 5	5	5	Newcastle & Gateshead Con.	75—77d	..	..
300,929	,,	,,	4	4	Do. 4 p.c. Pref.. .	76—77d	..	..
329,705	,,	Dec. 18	3¼	3¼	Do. 3½ p.c. Deb.	68½—69¾d	..	..
15,000	,,	Mar. 5	11	12	North Middlesex 10 p.c. .	..	..	118
75,940	,,	,,	7⅞	8⅜	Do. 7 p.c. . .	..	..	..
300,000	Stk.	May 7	9	7	Oriental, Ltd.	100—105	..	103—104¼
188,120	,,	Jan. 8	7½	7½	Plymth & Ston'house 5 p.c.	110—115	..	111
60,000	50	Mar. 5	13	14	Portsea Island B . . .	96—99	..	..
100,000	50	,,	12	13	Do. C	93—98	..	97¼—98
2,289,909	1	—	—	—	Primitiva Ord.	9/3—10/3	+/3	8/9—10/-
311,100	100	June 2	4	4	Do. 4 p.c. Red. Deb.. .	78—80	..	..
600,000	Stk.	Jan. 22	4	4	Do. 4 p.c. Red. Deb. 1910	64—66	..	..
220,335	,,	Dec. 18	4	4	Do. B. Aires 4 p.c. Red. Db.	65—67	..	..
321,670	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	65—67	..	66½—66¾
150,000	10	Mar. 19	6	6	San Paulo 6 p.c. Pref. . .	7¾—8¼	..	..
125,000	50	Jan. 2	5	5	Do. 5 p.c. Red. Deb.	43—46	..	..
270,000	Stk.	Mar. 19	5¼	5¼	Sheffield A	104—106d	+1	..
419,968	,,	,,	5¼	5¼	Do. B	104—106d	+1	..
1,047,000	,,	,,	5¼	5¼	Do. C	104—106d	+1	..
90,000	10	June 11	6	4	South African	7—9*	..	..
6,609,895	Stk.	Feb. 19	5	6¼	South Met. Ord.. . . .	93—95	..	92¾—94¼
1,895,445	,,	Jan. 8	3	3	Do. 3 p.c. Deb.. .	59—62	..	59¼—61
734,000	,,	May 7	6¼	6¼	Do. 3½ p.c. Red. Deb.	102¼—104¼	..	103—103¾
91,500	,,	Mar. 5	8¼	8¼	South Shields Con. . . .	135—139d	..	..
1,187,795	,,	Feb. 19	6¼	6¼	South Suburban Ord. 5 p.c.	94—97	..	94—96
368,837	,,	Dec. 18	5	5	Do. 5 p.c. Deb.	97—100	..	98¼
647,740	,,	May 7	5	5	South'mpt'n Ord. 5 p.c. max.	80—83	..	..
121,275	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	72—77	..	..
250,000	,,	Mar. 5	7	7	Swansea 7 p.c. Red. Pref..	102—104	..	103¼
200,000	,,	Dec. 18	6¼	6¼	Do. 6¼ p.c. Red. Deb..	103—105	..	..
120,000	,,	Feb. 19	8	8	Tottenham District A 5 p.c.	116—119	..	..
882,275	,,	,,	6¼	6¼	Do. B 3½ p.c.	93—98	..	94—96
150,000	,,	—	—	—	Do. 5½ p.c. Pref.	103—105	..	104¼
181,255	,,	June 11	4	4	Do. 4 p.c. Deb.	76—79*	..	..
258,231	,,	Mar. 19	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, & Wycombe 5 p.c.. . .	74—76d	..	..
197,294	,,	Feb. 19	6¼	6¼	Do. 5 p.c. . . .	95—100	..	..
88,330	,,	,,	5	5	Do. 5 p.c. pref. .	95—100	..	..
91,800	,,	,,	—	6¼	Do. 5 p.c. Maidenh'd	90—95	..	..
30,000	,,	Mar. 5	9¼	9¼	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c. .	130—135	..	..
255,636	,,	,,	7¼	7¼	Do. B 3½ p.c.t. .	110—115	..	..
392,955	,,	,,	6/9/6	6/9/6	Do. C and New	95—100	..	..
353,000	,,	,,	7¼	7¼	Wimbledon 5 p.c.t. . .	105—110	..	105
98,000	,,	,,	7¼	7¼	Epsom 5 p.c.t.. . . .	112—117	..	..
88,416	,,	Dec. 18	3	3	3 p.c. Deb.	57—60	..	..

Quotations at :—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. * Ex. div.

The Gas Salesman and Gas Service.

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APPOINTMENTS & PROMOTIONS.

Gas Salesmen, Showroom Attendants, and Manufacturers' Representatives are invited to send information as to promotion or changes in appointment for publication under this heading.

NOTICES.

Copies of this Supplement for Distribution among Members of the Gas Sales Staff, can be obtained at the office of the "Journal." Price per 100, 35s.; 50, 18s.; per doz. 4s. 6d.—plus postage; single copies, 5d. (stamps for single copies with order).

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EDITORIAL.

Cost and Benefits of Maintenance.

The maintenance of consumers' appliances in a high state of efficiency means the maintenance of much else. It results in the promotion of satisfaction, which inures to the maintenance of existing business, of the rate of progress of new business, of the resisting power of the industry to competition, and so forth. The gas salesman is therefore largely concerned in the much-discussed policy of the inspection, regulation, and maintenance of consumers' appliances in the best condition for rendering good service; the consumer only paying directly for the materials used. But though the gas salesman is considerably interested in the matter, the adoption of the policy is one that—and rightly so—can only be brought about by the advice of the chief executive officer, and its acceptance by the administrative body. At the same time it is a subject about which the gas salesman should have cognizance of all the *pros* and *cons*, though the weight of the *pros* leaves the *cons* dangling high in the air in rather a stupid fashion.

Some undertakings have had long experience of the system of inspection, adjustment, and maintenance; but they are relatively few, though there is a steady numerical growth. One thing, however, that is striking about the application of the policy is that there is never any return by those with experience to the old policy of allowing things to take care of themselves the other side of the consumers' meters. Another point is that the objections to the adoption of the policy only come from those who have no experience of its intrinsic merits and business protecting and promoting qualities. We have here a remarkable example of the power of tradition, and of refusal to recognize that times and conditions are mutable, and that methods should change to conform. The gas industry is much stronger than it was (say) a quarter of a century ago. During that period it has broadened and deepened its base in an extraordinary manner; and it sees before it territory for further development of an order which should inspire its men to do everything possible to obtain a large share of it. Into its occupation the electrical competitors are also striving to move; and they appear to be getting, in opposition to national interests, the upper place in political influence. That influence can only be an aid; the determining factor must be public preference. We have therefore to combat the political influence by building-up public preference. That is the gas industry's soundest policy; and it can best be done by ensuring efficiency and economy in the utilization of gas in the homes and industrial establishments of the country.

Recently the North British Association of Gas Managers have been further considering the question of the adoption of the policy of systematic and periodical inspection, adjustment, and maintenance of consumers' appliances; and we urge all gas salesmen to read the valuable contributions to the subject which were made by Mr. J. W. Napier, of Alloa, Mr. George Keillor, of Greenock, and Mr. J. W. M'Lusky, of Glasgow. They will be found in the report of the proceedings at the Spring Meeting of the Association, as reported in the "Gas Journal" [see April 8, 15, and 22]. The authors all speak from experience; and upon their experience they appeal to gas undertakings which have not yet applied the system to do so without delay. Advice founded upon experience is better than opposing argument based upon inexperience. The benefits of the policy are mutual as between consumers and undertakings. The consumers, through the expert attention, become more and more satisfied with the service. The satisfaction is due to the enhanced efficiency and economy that result; and contentment with existing appliances makes easier the road to the extension of the use of gas through the same service-pipe, which is an advantage to the gas salesman and to the undertaking he serves. What on earth is the good of a gas salesman trying to do further business with a discontented consumer, who does not know how to manage his appliances, or, if he does, declines to take the trouble? The benefit of giving good service by supervision up to

the gas consumers' terminals is manifold to the gas undertaking. It protects existing business, it promotes extended custom, the additional custom helps to reduce capital, establishment, manufacturing, and distribution charges to the benefit of both gas consumers and suppliers; complaints are reduced; and competitors find the barriers to making headway considerably strengthened. And mark this: Where there are diseased parts in the system of a trading organization such as gas—of the order found by Mr. M'Lusky in a survey of the indoor conditions in Glasgow—we may be sure that continued neglect will intensify the disease. He profits most who serves best. Those who are discerning, those who have the capacity for determining to-day what is best for the morrow, are the ones who will be top dogs in business as in other affairs of life.

The question of cost comes in. It is one which requires logical investigation. The expenditure incurred in inspection, adjustment, and maintenance is a fruitful one for both consumer and undertaking. It is better for the consumers to have to pay a penny or a fraction of a penny more per 1000 c.ft. or per five therms, to secure satisfaction through an improved and continued efficiency, than to use gas wastefully. The efficiency must mean economy in the consumer's expenditure for the work done; and it is better to pay a fair price for work being well done than badly done, because the latter always means uneconomy. Taking the Glasgow figures (to which reference will presently be made), we submit that, owing to the fact that the gas consumed is used more efficiently, the consumer really spends no more on gas through the inclusion of the cost of inspection and maintenance in the charge. As to the gas undertaking, there can be no question that financially the system is a sound and profitable one. There is the additional protection against competition; there is the inducement to the increased use of gas by the consumers. This increase is no visionary thing. All those who have applied the system find that it is easier to place additional appliances in houses than it was formerly. We have to thank Glasgow for highly valuable information as to the direct costs there, against which, of course, are to be set the advantages already mentioned, but upon which no definable value can be placed. However, the direct costs, Mr. M'Lusky shows, have been diminishing with the extension of the application of the system. This is no doubt due to the gradual elimination of bad conditions, and to the growing efficiency of the men in the work. At the outset the costs were estimated at 1½d. per 1000 c.ft.; afterwards they were found to be 1¼d. Now the figure has been reduced to 0·592d. per 1000 c.ft. Of this figure, labour accounts for 0·375d.; material, 0·084d.; and overhead charges, 0·133d. Per therm the cost is 0·126d.—labour representing 0·08d., material 0·018d., and overhead charges 0·028d. It is computed that in Glasgow there are 1,250,000 appliances in 213,447 premises; and at the moment 995,038 burners and appliances are being maintained. The cost, of course, would vary with local conditions; but the Glasgow figures offer not only guidance but encouragement. They show that the bigger the maintenance scheme becomes, the cheaper it gets; they also warn that the initial figures, when the rough work of elimination and correction is being done, must not be taken as indicating the permanent figure. In the discussion on the papers, it was shown that, in two smaller towns, the cost of maintenance per 1000 c.ft. is approximately the same as in Glasgow. We are convinced that, though the cost is included in the price of gas (users of heavy consuming appliances can be justly treated by discounts), the expenditure is a profitable one for both undertakings and consumers.

Costs of Different Lights.

Gas salesmen who have been studying "An Elementary Treatise on Gas Lighting," which has been one of the features of "The Gas Salesman" for a long period, will be prepared to agree with us that not the least important of the constituents of this valuable contribution is the material which is now being presented. It deals, among other points, with the costs of lighting by the different competing agents—in which connection it is always well for the gas salesman to remember that electricity is not the only competitor. The candle, the oil-lamp, acetylene, and petrol-air gas, have their places in the realm of artificial lighting; and yet, on calculations which may be accepted as the result of scrupulous testings and computations, our contributor is able to show that incandescent gas lighting takes precedence in the amount of light afforded for a given sum, taking the charges for the agents at the figures quoted at the foot of Table 5. It is to that table that we wish to direct particular attention, because there we have concentrated the results of a laborious and time-absorbing piece of work. We believe that the table will be utilized for reference almost universally by gas salesmen, because there is not the slightest doubt it will be of considerable use to them in their work.

It will be seen that the data embrace all the competing sources of lighting—including the humble candle, the oil-lamp, acetylene, petrol-air gas, away up to the flaming or impregnated carbon type of electric lamp, as well as the much-talked-of gasfilled lamp. The light values given are for the different illuminants with the sources unscreened. But, of course, the higher one gets in intrinsic brilliancy of the source of light, the greater the necessity for screening it for the protection of the eyesight; and this protection naturally reduces the light values afforded to the user. Looking at the figures, it will be seen that the low-pressure inverted incandescent burner, using 25 B.Th.U. per M.H.C.P., will give (with gas at 8d. per therm) 6000 candle-power-hours for 1s. The advantage of the inverted preheated cluster burner is emphasized when we find that the input required is reduced to 16 B.Th.U. per M.H.C.P., and that 9375 candle-power-hours can be bought for 1s. This advance has nearly halved the margin which formerly existed between the ordinary inverted gas-burner and the high-pressure inverted burner, seeing that, with gas at 80 in. pressure, and an input of 10·5 B.Th.U. per M.H.C.P., 14,286 candle-power-hours can be purchased for 1s. The next best achievement compared with ordinary low-pressure inverted or preheated cluster burners is petrol-air gas used in inverted incandescent burners. In this case, taking petrol at 17d. per gallon, we get 5506 candle-power-hours for 1s. The best that the electric metallic filament lamp of the vacuum type can do, using 1·25 watts per M.H.C.P., is to provide 1920 candle-power-hours for 1s. (electric energy being taken at 5d. per KW.H.), which is a long way in the rear of the ordinary inverted incandescent gas-burner. The electric gasfilled lamp, using 0·66 watt per M.H.C.P., comes nearer with 3636 candle-power-hours for 1s. But it will be seen that this has to compare with 6000 candle-power-hours by the ordinary incandescent burner, and with 9375 candle-power-hours by the preheated cluster burner. In the course of the article, our contributor points out that though electric sources require to be supplied with far less heat energy than incandescent gas sources to produce equal amounts of light—for example, the gasfilled incandescent lamp expends 2·26 B.Th.U. per candle-power-hour, as against 25 B.Th.U. per candle-power-hour by the low-pressure inverted incandescent gas burner—the superior thermal efficiency of electric sources does not make electric light as cheap as gas light, simply because the transformation of electrical energy into heat is a far more expensive process than the generation of heat by burning gas.

We think enough has been said to direct attention to the special value to gas salesmen of the part of "An Elementary Treatise on Gas Lighting" which is now appearing in our pages.

"B.C.G.A." and Salesmen.—At a Midlands District Conference of the British Commercial Gas Association, which was recently held in Leicester, Mr. A. W. Smith (the General Manager and Secretary of the Birmingham Corporation Gas Department) referring to the operations of the Association, said that the Salesmen's Circles were doing wonderfully good work. It had been astonishing to see the enthusiasm of the salesmen; and this one thing alone, he declared, was sufficient to justify the activities of the "B.C.G.A."

Gas for Making Automobile Parts.—The radiator department of the Highland Park (U.S.A.) plant of the Ford Motor Company uses 270,000 c.ft. of coke-oven gas a day. It is, remarks Mr. F. I. Newton, in the pages of the "Gas Age-Record," interesting to note that the total daily consumption of the Highland Park plant is 44 million c.ft. of coke-oven gas, and 62 million c.ft. of producer gas; while the Ford Company's River Rouge plant uses about 10 million c.ft. of coke-oven gas daily. Of the total heating operations performed at the Highland Park works, 73 p.ct. are done with gas.

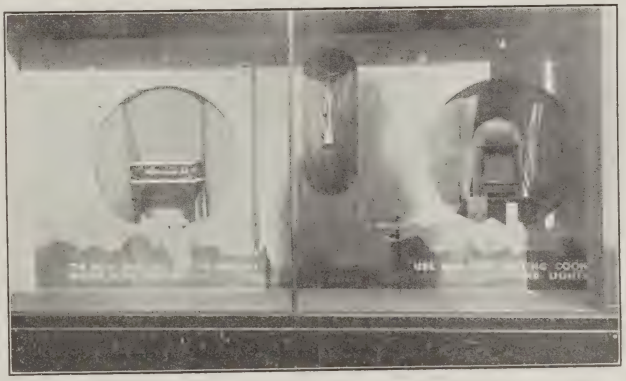
Window Displays at Greenock.

We reproduce two photographs of novel window displays in the showrooms of the Greenock Corporation Gas Department, which are excellent examples of really effective advertising.

The east window was intended to throw into bold contrast the uncivilized method of cooking in A.D. 1 and the highly civilized popular method in 1925. This effect was strikingly obtained by depicting a cave-man holding on the end of a stick a piece of meat over a fire; while in the recess of the cave, which formed the background, was a modern gas cooker. A most realistic note was struck by building the rocky background with a rugged contour before painting. Realism was carried further by having a bright red glow emanating from the embers of the fire, and by having sand and stones on the ground, and a prehistoric cudgel lying handy. A humourous touch was obtained by having the head of an ancient monster, with gaping maw, thrust over the jagged rocks, just above and to the rear of the kneeling cave-man. The only lettering which appeared was that on the cooker "A.D. 1925," and on the rocks in front "A.D. 1." The entire cave was constructed of old cardboard boxes.

The west window was designed with the purpose of setting out the "bottled sunshine" way to a clear atmosphere, and, incidentally, three of the most popular gas appliances which help greatly towards the dispersing of the obnoxious pall of smoke. A back frame was draped in blue cloth and had two 4 ft. diameter circular cut-outs and a central oval cut-out 4 ft. high by 1 ft. 6 in. wide. The circular cut-outs displayed a cooker and a fire, and the oval a chaste pendant, to advantage. At the base and in the centre of the background, a yellow sun-like half-circle embodying a small picture of a "sunshine factory" (gas-works) was interposed, and from it radiated yellow ribbons reaching across, and relieving, the background. Midway betwen the front of the window and the background, a silhouette of chimneys and buildings extended from side to side. On this black silhouette, in white letters, the following sound counsel was written: "The wise way to a smoke-free atmosphere is the gas way," and "Use 'bottled sunshine' for cooking, heating, and lighting."

COOKING IN A.D. 1 AND 1925.



SYMBOLIZING "BOTTLED SUNSHINE."

Consumers' Literature.

Among the go-ahead companies in the preparation of literature for distribution among consumers is the Croydon Gas Company. Their pamphlets and leaflets are invariably of a high-class order—the matter they contain being sound and irrefutable; they are well illustrated, and in attractiveness court and obtain admiration. Among those we have received is a gas-fire pamphlet, with a coloured picture on the outside which cannot fail to invite attention and investigation of the material and illustrations found between the covers. A useful accompaniment of most of this literature is a printed post-card addressed to the Distributing Engineer and Sales Manager of the Company, giving on the reverse side a skeleton form for the name and address of the consumer, and asking for a representative to call, on the date and hour given, with reference (as the case may be) to gas heating, cooking, &c.

Another booklet deals with "Electric *v.* Gas Cookery." On the subject of electric cooking, there is a great deal of loose talk by our rivals about gas cooking fumes spoiling food and loss of weight of joints. Some of the claims that are electrically made in the latter respect would suggest that the difference in loss of weight between the one cooking agent and the other is such that almost the whole cost of the meat is saved by using an electric cooker instead of a gas cooker. Heat is heat, however generated. Of course, among the claims of the electrical people, there is rarely any reference to the performances of the hotplate on which such a large proportion—generally close upon 80 p.ct.—of the culinary work is done. The hotplates of electric cookers are notoriously inefficient, and they quickly lose such efficiency as they originally possessed. Consequently, the high cost of the potential heat generated by a unit of electricity, together with the low efficiency in use, makes electric cooking the most expensive of all methods. In the booklet it is asked by the Croydon Gas Company: "Can the arguments used on behalf of the electric cooker and those urged against the gas cooker be substantiated?" The reply is: "We think not." And then the leaflet proceeds to recount some of the things the electric people are telling the public:

(1) That cooking by electricity is no more costly than cooking by gas.

(2) That meat cooked in an electric oven suffers far less loss of weight than a joint of equal weight (when uncooked) cooked in a gas oven.

(3) That food cooked in an internally-heated gas oven is "affected" because it absorbs the combustion products.

These typical statements are untrue. The actual fact is that one gas therm will in cooking perform the same practical service as 20 units of electricity, on the assumption that of the energy used for cooking 75 p.ct. is applied on the hotplate and 25 p.ct. in the oven. At the time this booklet was prepared, the cost of a gas therm in Croydon was 8·8d.; while 20 units of electricity, at the low figure of 1d. per unit, cost 1s. 8d. Therefore it is a fact that electric cookery is approximately two-and-a-half times as costly as gas cookery.

Then as to the weight of meat. It is pointed out (quoting *in extenso* from the booklet) that there is little or no difference in the shrinkage or loss of weight of a joint cooked to the same degree in either a gas oven or an electric oven. Meat, as is well known, contains a considerable percentage of water. The evaporation of that water during cooking operations is naturally bound to make some difference in the "before cooked" and "after cooked" weights. Independent authorities tell us that from 2 to 3 oz. in weight per lb. is so "lost" if a joint is not to be served up under-cooked. Owing to the varying nature of animal tissue in different joints and the different proportions of bone and fat contained in them, it is quite an easy matter to make very misleading "comparative" tests, and say that one system of cooking is more "wasteful" than another. The supposed "saving of meat" is, of course, simply a question of the retention of moisture in the meat. If it is desired to cook meat in such a way as to retain within the joint the maximum amount of water contained in the raw meat, this can be done as fully and as

easily in a gas oven as in an electric oven. Again, if one wishes to cook the meat more thoroughly—*i.e.*, to expel a larger quantity of moisture—this can be effected as perfectly in a gas oven as in an electric oven; but to produce the same result in an electric oven, the period of cooking must be prolonged to an inconvenient length, because the atmosphere in an electric oven remains moist through deficient ventilation. Meat cooked slowly in a gas oven does not shrink any more than meat cooked slowly in an electric oven. The various fanciful figures of "saving" are arrived at by "racing" the meat in a gas oven.

In reference to the so-called "contamination" of food by gas fumes—the two harmless substances, water vapour and carbon dioxide, both of which are evolved by food during the process of cooking—reminder is given of an article by Elizabeth Lucas, on "The Case for the Casserole," which appeared in the "Daily Mail" for Sept. 25, 1924. Among the points made by the writer were:

All food cooked in an oven loses weight, the bulk of the loss being steam; and therefore "fumes" are flowing away from the food and not into it, which is one reason why the "fumes" from gas cannot be absorbed.

To emphasize that foods being cooked are not liable to absorb "fumes," it may be mentioned that if onions are cooked in an oven at the same time that a cake is being baked, the cake does not acquire an onion flavour, although if "fumes" were being absorbed such an effect would be expected.

A further point is made of the greater flexibility of control which there is in the taps of a gas cooker as compared with the three-temperature control switches of the electric cooker.

Another pamphlet which also particularly attracts us is entitled "Model Kitchens for Modern Homes;" and in this there are photographs of typical installations of gas and coke appliances in Croydon and the district. The illustrations are highly attractive, and should be the means of greatly stimulating a widespread desire for the compact cooking and hot water installations which are shown. At the end of this revelation to householders as to what gas and coke can do is an announcement that a representative of the Company will be happy to call *at any desired time* to give personal advice, and, on request, estimates will be gladly submitted. It is also pointed out inquiries place the householder under no obligation whatever.

The Education of the Gasfitter.

By THOMAS NEWTON.

The admirable contribution on "The Education of the Gasfitter" which Mr. Rogers made at the Annual General Meeting of the Midland Association of Gas Engineers and Managers (see "JOURNAL" for March 18, p. 675) is opportune. The importance of the subject cannot be overemphasized, especially when it is remembered that progress in the future can only be made with the aid of intelligent, competent, and willing workmen.

Much well-founded criticism has recently been levelled at the present-day product of our elementary schools; and, unfortunately, such criticism is not confined to any one part of the country. The product of our elementary schools; and, raw material out of which the gasfitter is ultimately evolved. Yet what can be said in favour of this product when boys of 14 years of age, fresh from school, write "gass" for gas, "sirvis" for service, "flew-pipe" for flue-pipe, "boler" for boiler, "geeser" for geyser, "excape" for escape, and so on? In elementary arithmetic the most appalling inaccuracies are made; while grammar is a thing of the past. A schoolmaster seriously remarked to the writer some time ago that elementary education was largely a matter of fashion, and, since grammar was no longer fashionable, it was not taught in elementary schools. Be this as it may, it is high time that employers of labour demanded a much more intelligent "product" on which to commence operations.

In view of the foregoing, it is indeed questionable if boys of 14 years of age should be taken from our schools while they are so obviously unprepared to benefit from such technical education as must needs be imparted to them before they can become specialized workmen. Certainly, a much sounder elementary education is essential as a preliminary; and if the boys leave school before they receive this, it simply means that the employers must endeavour to make up for the deficiencies of the schoolmasters—and this without the schoolmasters' facilities.

The training of boys is not so simple as it used to be. Formerly, under the old apprenticeship system, a boy had little difficulty in picking-up the manual or physical part of his trade, primarily because the habit of industry was thoroughly inculcated on every possible occasion. The pride of craftsmanship was very real; and this engendered a keenness which rapidly developed into proficiency. In the old days, the keen boys found ways and means of educating themselves, both theoretically and practically, as many who now deservedly hold administrative positions can testify. Nowadays, unfortunately, the apprenticeship system has declined; and keenness among boys is not so conspicuous as it was formerly. In the conditions which prevail, boys have more facilities than formerly, yet, strange to say, they do not appreciate them as they should.

It is a common complaint that youths who under a system of apprenticeship would be both willing and energetic, are nowadays prone to be independent of the employer, because they can easily become dependent on the State. This state of affairs has ruthlessly crushed incentive where it has not completely destroyed it.

Employers have now to devise new methods and machinery whereby the youth of the industry shall be properly trained. The Birmingham system is ideal, being so comprehensive as to cover practically the whole ground; but, unfortunately, the smaller undertakings cannot hope to emulate Birmingham's example. In the first place, the smaller undertakings do not possess the necessary facilities, nor do they employ such numbers as could be formed into classes. What boys are employed are usually of different ages, and in various stages of development. In the circumstances, class tuition would appear to be precluded, and individual tuition essential. The smaller undertakings could not hope to put at a boy's disposal the same advantages as those enjoyed by the boys of (say) Birmingham, London, or Leeds. But keenness on the boy's part, and some individual tuition, would soon enable a boy to surmount many of his disadvantages. Much depends on the type of boy selected. For example, it would be an immense advantage both to the boy and his employer if the boy started to work when he was about 16 years of age, and particularly if he had spent the last two or three years of his school life at a secondary school. Such a boy would be sufficiently mentally equipped to take full advantage of the technical and scientific instruction that might subsequently be provided by his employer.

If objection be made that the age and standard of education here outlined are too high, it should be borne in mind that the gas industry has need of well-educated fitters. It is in the highest interest of the industry that the gasfitter of the future be well educated; and besides being a competent craftsman, he should also have a certain amount of scientific and technical knowledge. He must, of course, be competent to do his work; and he must also know the why and wherefore. For, after all, a gasfitter is the undertaking's representative who is always in direct contact with the undertaking's consumers, and his advice is sought—often casually, sometimes deliberately—on the hundred-and-one questions appertaining to the utilization of gas. He should be able to impart accurate information about his business in such a manner as will inspire the customer's confidence.

Here we may inquire if it would not be advisable to revive some form of the apprenticeship system for a period of four or five years; and, as some compensation for the additional time spent at a secondary school, it may be feasible to provide facilities for technical and scientific training wholly, or partly, during working hours. In these days, boys and their parents do not feel disposed to make all the sacrifices. Some undoubtedly do, but these are exceptions.

Any consideration of the education of the gasfitter would be incomplete without reference to the rewards which are offered for intelligent and competent service. Unfortunately, some are by no means tempting, and are but a meagre incentive, considering the study, time, and labour involved in becoming qualified and proficient. The bare statement that only nineteen fitters out of the whole of the British gas industry presented themselves last year for the final examination is a sufficient commentary.

Of course, it should be borne in mind that promotions to higher positions are made from the ranks of those fitters who are educationally and technically competent. This is indeed a great incentive for the few; but it will only be confusing the issue if we imagine that it is an effective incentive for the many. What seems to be required nowadays is a sufficiently strong inducement to the study that will produce highly-trained and competent gasfitters, even though they are compelled, or desire, to remain in the ranks.

Unless this attraction is offered, only a comparative few will think the effort worth while, and these few will assuredly leave the ranks at the first opportunity. The ideal to be aimed at is not to train a few fitters, offering as an inducement to study the possibility of promotion to higher positions; for in this case the ranks would be the poorer. Rather should it be to raise the standard of the fitters as fitters; and to make the training and study worth their while, apart from promotion.

In this connection, the assistance of the various trades unions would be invaluable. If a trade union is keenly interested in raising the status and wages of its members, it is only logical that it should also be equally interested in any movement which has for its object the technical training and general competency of its constituents. The gain to any industry which could agree on a working arrangement with its trade union (or unions) concerning the training and competence of the workmen engaged in that industry would be enormous.

The education and training of the gasfitter is a vital question for the gas industry; and the responsible heads of undertakings should give every possible encouragement, with a view to its solution along right lines. The old days when gasfitting was regarded as an insignificant sideline of plumbing are gone for ever.

An Elementary Treatise on Gas Lighting.

For the Student Gas Salesman.

[Communicated.]

(*Continued from p.* 58.)

Chapter 10.

Miscellaneous Considerations.

There have now been discussed the principal points connected with the progressive design of gas-lighting burners and lamps during the past century; and the primary factors essential to their efficient performance have also received consideration.

In this chapter it is hoped to deal with several other important aspects of gas lighting—matters of commercial as well as of technical significance, and including (*a*) the cost, quality, &c., of gas light as compared with electric light and other illuminants; (*b*) uses and effects of globes, shades, and reflectors; (*c*) an outline of "direct," "indirect," and "semi-indirect" systems of artificial lighting and their relative efficiencies; and (*d*) a short account of distance lighting and extinguishing equipment. With these further necessary questions disposed of, the way should be fairly clear for us to proceed with our study of the elements of illuminating engineering, uninterrupted by other by-the-way considerations.

The respective costs of producing light by different methods is an all-important question because, by reason of our standard of civilization, we in the British Isles spend annually a colossal sum of money* in purchasing artificial light in one or more of its several available forms. Now in terms of £ s. d. to the purchaser the most economical artificial illuminant is incandescent gas; and it is also the most satisfactory in regard to quality. But are the public made sufficiently cognizant of these important truths? The dissemination of knowledge on these points is one of the gas salesman's functions, for, since the sale of artificial light is still one of its trading functions, the gas industry is, of course, concerned commercially with the comparative costs of producing light by various processes in its desire to provide the public with the cheapest, best, and most reliable modern illuminant—a desire which is creditably realized.

The cost of producing light is obviously related to the particular method adopted; and it is a very variable factor, for, as will be seen later, there are many widely dissimilar methods. Before we can compare the respective costs of these methods, we must adopt a unit for quantity of light; and this unit will be the candlepower-hour—a term which means the total quantity of light radiated during one hour by a source of one candlepower intensity. It will also be necessary for us to specify, within reasonable limits of accuracy, the quantities of combustible material and electric energy required to produce our unit of light†; and further we shall have to assign to these light-yielding agents certain purchase prices. However, before tabulating these data the writer desires to say a little more about certain of the illuminants themselves.

With the ever-growing availability of public supplies of gas and electric energy at popular prices, gas and electric light have very largely superseded candles and oil lamps; and together these two former agents provide to-day the great proportion of the artificial light used in Great Britain. But there are still many occasions when gas and electric light cannot be employed; and because of this, coupled, of course, with the demand for something better than candle-flame and oil-flame light, there have been developed other and newer materials for the production of artificial light—such as acetylene and petrol-air gas—which are highly acceptable to residents in rural districts remote from gas and electric energy supply systems.

There have also been placed upon the market incandescent-oil lamps. Though we are not very much concerned in this work with the manufacture of gas and other light-producing agents, the student may, in a competitive sense, be interested to know something more about acetylene and petrol-air gas; but, deferring for the moment our consideration of these, the writer would first say a few words regarding the consumption of material by the common candle and the ordinary oil lamp. The common commercial candle gives a light approximating in intensity to that of the fundamental unit of light measurement—viz., the International Candle; and it consumes material at the average rate of (say) 120 grains (equal to 0·017143 lb.) per hour. One pound of candles will therefore yield 58·3 candlepower-hours $\left(\frac{7000}{120}\right)$.

[There are 7000 grains to the lb.] Oil lamps vary considerably in candlepower from (say) 10 to 60 (horizontal rating); and it has been stated* that as much as 100 c.p. can be obtained with carefully-designed petroleum lamps. According to the late Dr. Louis Bell† the consumption of oil per candlepower-hour may be taken as ranging from 50 to 60 grains, say an average rate of 55 grains, equivalent to 0·00119 gallon (approx.) assuming the use of kerosene weighing 6·6 lbs. per gallon. One gallon of kerosene will therefore yield 840 candlepower-hours $\left(\frac{7000 \times 6{\cdot}6}{55}\right)$.

Candle manufacture and the chemical constitution of illuminating oil were referred to in Chapter 2—see "Salesman" for Sept. 27, 1922.

Acetylene is a rather heavy and colourless hydrocarbon gas (sp. gr. = 0·92‡), having the formula C_2H_2 and being possessed, in its usually slightly impure form, of a most objectionable odour. It is a substance extremely rich in carbon, containing over 90 p.ct. by weight of this element, and has a gross calorific value of 1441 B.Th.U. per c.ft. (by test). Because of its high flame temperature§ and generous carbon content, acetylene, when burned in properly constructed burners with the correct admixture of air to prevent "smokiness," produces a steady flame which by virtue of its brilliant white light far surpasses the duty given by any other flame illuminant. When water is brought into contact with calcium carbide, there are formed, according to the following reaction, lime and acetylene gas:

$$\underset{\text{calcium carbide}}{CaC_2} + 2\,\underset{\text{water}}{H_2O} = \underset{\text{lime}}{Ca(OH)_2} + \underset{\text{acetylene}}{C_2H_2}$$

[Strictly speaking, this equation is true only of *pure* acetylene.]

Various foreign substances, due to chemical impurities very generally present in commercial carbide, are found in acetylene; and it is therefore necessary to purify the gas as much as possible by washing it with water. For the supply of acetylene to isolated premises, several makes of reliable automatic and non-automatic generating and purifying plants are available in a variety of sizes according to the number of lights they are required to serve. The selected plant is housed outside the main-building, and it supplies gas, usually at a pressure of 3 to 4 in. of water, through a system of house-piping (smaller in diameter than that commonly used for town gas) to the required lighting points. Preferably, acetylene flame burners should be of the air-injection type; and these are made in a variety of sizes, taking from 0·25 c.ft. to 1·25 c.ft. per hour, and yielding an average duty as high as 40* candles per c.ft. per hour (horizontal rating). We can thus assign to acetylene flames used for indoor lighting a commercial efficiency of 0·025 c.ft. per candlepower-hour. In actual practice the average yield of acetylene per pound of calcium carbide acted upon is of the order of 4·5 c.ft.† Hence 1 lb. of this material will yield sufficient gas to give 180 candlepower-hours (4·5 × 40); and 1 ton will yield (say) 10,080 c.ft. of gas, having a light equivalent of 403,200 candlepower-hours. The weight of carbide required per candlepower-hour is therefore approximately 0·0055 lb. Various attempts have been made to apply the incandescent mantle principle to acetylene by burning the gas in specially-designed atmospheric burners; but several practical difficulties have asserted themselves. The tiny burner orifices are apt to get choked, and satisfactory burner performance calls for the manufacture of highly-purified gas and for its distribution at a fairly high and constant pressure—say, about 6 in. of water. Provided the acetylene can be properly "bunsenized," the very high flame temperature which results can be used to economical advantage with small mantles of robust manufacture; and it has been stated that inverted incandescent acetylene burners—nominally of 60 c.p. intensity—realize the remarkable efficiency of 100 c.p.‡ per c.ft. per hour. This is equivalent to 0·010 c.ft. of gas, or to 0·0022 lb. (approx.) of calcium carbide per candlepower-hour. One pound of carbide will therefore yield 450 candlepower-hours (4·5 × 100) by the incandescent mantle system. Where portability is a necessary requirement, acetylene is a convenient illuminant, as it can be stored with comparative ease and safety by dissolving it in acetone—an organic liquid substance which "takes up" twenty-five times its own volume of acetylene at normal temperature and pressure, and about ten times this quantity under a pressure of 150 lbs. per sq. in. at the temperature of 15° C. In calculating the cost of producing light by means of acetylene, one must, of course, bear in mind not only the material from which the gas is made, but also the capital outlay on generating equipment, depreciation of plant and attendance charges, including handling and storing expenses. These

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* As far back as 1906 the late Prof. Silvanus P. Thompson, D.Sc., F.R.S., in the course of a lecture delivered at the York Meeting of the British Association, said that "we in Great Britain spend annually a gigantic sum, estimated at from £10,000,000 to £20,000,000, in manufacturing for ourselves such artificial light as our civilization demands."

† This has already been done in the case of incandescent gas burners: but the data given in Table 2 are recapitulated in Table 5, for the sake of completeness.

* See "Modern Illuminants and Illuminating Engineering," by Gaster and Dow, 1915.

† See "Art of Illumination," by Dr. Louis Bell, 1912.

‡ Air as standard—*i.e.*, 1·0c.

§ The ordinary flame temperature of acetylene is in the neighbourhood of 2200° C. (Bell.)

* This is the figure which is usually taken when estimating for generator capacity. [Acetylene burner data as given in A. Blok's "Elementary Principles of Illumination and Artificial Lighting," 1914.]

† The theoretical yield of C_2H_2 per lb. of CaC_2 is 5·6 c.ft.

‡ Horizontal candlepower rating, presumably.

TABLE 5.—*Statement of Comparative Costs of Manufacturing Light by Different Methods.*

Method of Manufacturing Light.	Weight or Volume of Material, No. of B.Th.U. and Quantity of Electric Energy Required per Candlepower-Hour (Approx.).	Cost. Pence per Candlepower-Hour (Approx.). (*a*)	Cost. Pence per 1000-Candle-power-Hours (Approx.). (*b*)	Cost. Candlepower-Hours Purchased for 1s. (Approx.). (*c*)
By (1) candle (ordinary commercial type)	0·017143 lb. (horizontal rating)	0·085715	85·715	140
,, (2) oil—				
(*a*) Domestic wick lamp	0·00119 gall. (horizontal rating)	0·01666	16·66	720
(*b*) ,, incandescent mantle lamp*	0·000216 ,, ,, ,,	0·003024	3·024	3,960
,, (3) town gas—				
(*a*) open flame burner	0·4 c.ft.†	0·01200	12·00	1,000
(*b*) low-pressure upright incandescent burner	45 B.Th.U. (m.s.c.p. rating)	0·00360	3·60	3,333
	34 ,, (horizontal ,,)	0·00272	2·72	4,412
(*c*) ,, inverted ,, ,,	25 ,, (m.h.c.p. ,,)	0·00200	2·00	6,000
(*d*) ,, ,, ,, * pre-heated cluster-burner	16 ,, (,, ,,)	0·00128	1·28	9,375
(*e*) high-pressure (80-in. W.G.) inverted incandescent pre-heated burner	10·5 ,, (,, ,,)	0·00084	0·84	14,286
,, (4) acetylene—				
(*a*) open-flame burner	0·025 c.ft. C_2H_2; or 0·0055 lb. CaC_2 (horizontal rating)	0·01100	11·00	1,080
(*b*) inverted incandescent burner	0·010 c.ft. C_2H_2; or 0·0022 lb. CaC_2 (horizontal rating)	0·00440	4·40	2,700
,, (5) petrol-air gas used in inverted incandescent burner	0·000128 gall. (m.h.c.p. rating)	0·002176	2·176	5,506
,, (6) electric energy—				
(*a*) carbon filament lamp (low efficiency, 800 hours' life type)	4·05 watts (m.h.c.p. rating) equivalent to 13·85 B.Th.U.	0·02025	20·25	592
(*b*) ,, ,, ,, (high efficiency, 400 hours' life type)	3·52 watts (m.h.c.p. rating) equivalent to 12·04 B.Th.U.	0·01760	17·60	682
(*c*) metal filament lamp (vacuum type)	1·25 watts (m.h.c.p. rating) equivalent to 4·27 B.Th.U.	0·00625	6·25	1,920
(*d*) ,, ,, ,, (gasfilled type)	0·66 watt (m.h.c.p. rating) equivalent to 2·26 B.Th.U.	0·0033	3·30	3,636
(*e*) arc lamp (ordinary or plain carbon type)	1·25 watts (m.s.c.p. rating) equivalent to 4·27 B.Th.U.	0·00625	6·25	1,920
(*f*) ,, ,, (flaming or impregnated carbon type)	0·265 watt (m.s.c.p. rating) equivalent to 0·91 B.Th.U.	0·001325	1·325	9,056

* Upright mantle type. A much higher efficiency is claimed on behalf of certain oil-vapour inverted mantle lamps of relatively high luminous output (say, 300 c.p. upwards). These high-power incandescent oil lamps are spoken of in the text.

† 16 c.p. quality—old illuminating power standard. Price (say) 2s. 6d. per 1000 c.ft.

In the table, columns (*a*) and (*b*) have been calculated from the quantities given in the first column; but in certain cases the values in column (*c*) have been determined on the basis of the number of candlepower-hours provided by 1 lb. of candles, 1 gall. of oil, &c., at the listed prices. Since, in the reduction of these values from candlepower-hours per lb. or gallon to the decimal fractions of the lb. and gallon per candlepower-hour, some of the values in the first column have had to be approximated to restrict the number of figures, one or two of the end column values (*c*) will differ very slightly from the tabulated values if one evaluates them on the basis of the approximate quantities in columns (*a*) or (*b*), because, as already explained, the figures in column (*c*) have been derived from the number of candlepower-hours (as mentioned in the text) bought in the form of 1 lb. of candles, 1 gall. of oil, &c.

NOTE.—The monetary values in the above table are related to the following fair average purchase prices of the materials and electric energy involved in the light-making processes under review:

(1) Commercial candles	per lb. 5d.	(4) Calcium carbide	per lb. 2d.
(2) Kerosene oil, flash-point 110° Fahr.	per gall. 14d.	(5) Petrol	per gall. 17d.
(3) Town gas	per therm 8d.	(6) Electric energy	per kilowatt-hour 5d.

latter are constituent items of "all in"* cost, and they apply equally—and must not be overlooked—in the case of petrol-air gas lighting, to which method we shall now make brief allusion.

Petrol-air gas is simply air saturated with the vapour of volatile hydrocarbons, varying in specific gravity from about 0·68 to 0·74, and forming the substance known commercially as petrol. In Great Britain the proportion of petrol vapour to air is lower than that often used in America, and it seldom exceeds more than about 6 p.ct. by volume. Such a gas would be regarded in British practice as relatively rich, as in a number of plants only 1·5 to 2 p.ct. of petrol vapour admixture is employed.† There are many suitable machines available for the manufacture of petrol-air gas, and they are simple in operation—consisting essentially of a form of carburettor and a storage holder which delivers the gas to the house piping system usually at a pressure of 1·5 to 2 in. of water. "Lean" petrol-air gas as generally manufactured in this country gives very satisfactory results when used in conjunction with incandescent mantle burners. The manufacturing plant is usually installed in an outhouse; and the premises are carcassed much in the same way as for town gas.‡ The size of incandescent petrol-air-gas burner commonly used approximates to that of the town gas "bijou" burner; and there has been claimed for it a luminous output of from 70 to 80 c.p. (with new mantle) for a consumption of $\frac{1}{10}$ gallon of petrol per hour.* It would seem, however, that these values of luminous intensity and petrol consumption relate to horizontal candlepower; and if we think in terms of m.h.s.c.p. it is fairly evident that the average performance of such a burner would not be more than about 60 c.p. On this rating the petrol consumption per candlepower-hour is approximately 0·000128 gallon—the quantity suggested in Table 5 and derived from the figure of 7800 candlepower-hours per gallon.†

Oil lamp design has undergone a noteworthy change during the past fifteen years or so. Oil has altered in character from a flame illuminant to an incandescent radiant, consequent upon an improved method of burning it whereby the old-time wick can be superseded by the incandescent mantle. There have been available for some years various types of upright and inverted self-contained incandescent oil-lamps in which petroleum is vaporized and mixed with a generous quantity of air to form a clean-burning non-luminous flame possessed of the requisite temperature to render mantles incandescent. One particular make of domestic incandescent oil lamp equipped with a rather "squat" upright mantle is stated to yield 80 c.p. (presumably this is the horizontal candlepower) and to burn a mixture of 94 p.ct. (by volume) of air and 6 p.ct. of oil vapour. The oil consumption of such a lamp appears to be of the order of 10 grains per candlepower-hour; and, therefore, assuming the use of kerosene weighing 6·6 lbs. per gallon, 1 gallon of oil provides a lighting service of 4620 candlepower-hours.* The design and performances of one or two types of high-power inverted incandescent oil lamps are interesting matters which are discussed in the comprehensive work of Gaster and Dow.† These gentlemen mention that claims of the order of 14,000 candlepower-hours per gallon of oil—and even as high as 18,000 candlepower-hours—have been made on behalf of certain large lamps; and they also refer to the fact that on the Continent the principle of the incandescent mantle has been applied to burners consuming alcohol.

* The prices of oil, gas, and electric energy cover materials and manufacturing costs (they are, as it were, "prices delivered"), whereas the prices of acetylene and petrol-air gas, as given in Table 5, are exclusive of manufacturing charges.

† A mixture of 2 p.ct. of petrol vapour and 98 p.ct. of air would have a calorific value of 71·6 B.Th.U. per c.ft.

‡ Where "lean" petrol-air gas is used, rather larger pipes are usually run than those generally provided for the supply of town gas for incandescent lighting.

* See data given in "Modern Illuminants and Illuminating Engineering." (Gaster and Dow.)

† If $\frac{1}{7\frac{1}{2}\frac{1}{0}}$ gallon per hour yields 60 c.p., 1 gallon will yield 60 × 130 = 7800 candlepower-hours.

* $\frac{6\cdot6 \text{ lbs.} \times 7000 \text{ grains}}{10}$

† "Modern Illuminants and Illuminating Engineering."

(To be continued.)

Factors in Writing Selling Letters.—In a contribution to "System," Mr. J. H. Picken sets out the following views on the drafting of selling letters: The opening must appeal to something interesting in the mind of the reader, and must contain the proposition that is the subject of the letter. It must have a "leading" quality (an appeal to the curiosity), and must conform with the six principles of business letter writing. These are: (1) Do not arouse debate or denial. (2) Do not "side track" the prospect's interest by lack of continuity. (3) The letter must be easy to read. (4) Tell a complete story. (5) Stress advantages gained, not disadvantages avoided. (6) Avoid as far as possible propositions calling for a choice by the reader.

B.C.G.A. Gas Salesmen's Circles.

Southern District—London Area.

The April Meeting of this Circle was held on the 7th inst.—Mr. Stephen Lacey, Chairman of the Circle, presiding.

LOCAL PUBLICITY.

By W. D. Elson, of the "B.C.G.A."

Need for Local Publicity.

It is an accepted axiom that, in these days of keen competition, a business cannot stand still. It must either progress or retrogress; and, so far as the gas industry is concerned, publicity coupled with good service provides the chief means of development. The possession of a virtual monopoly has a tendency to restrict effort until it is recognized that, in effect, a gas undertaking is in a position of trust in relation to the community, and possesses a responsibility for demonstrating the services it is in a position to render to each individual member of that community. The success of each undertaking is in direct proportion to the efforts it makes to achieve that object. The last decade has seen the industry progress with great strides, but there still remains a wonderful field for development; and organized effort is the sure means by which success can be achieved. Competition there must be, and in ever-increasing strength; but this should be welcomed rather than deprecated, promoting as it does a healthy rivalry and a spur to increased effort and a security against stagnation.

Local Publicity Defined.

Local publicity may briefly be described as the seed which must be sown if a harvest is to be available for the salesmen's reaping, and, to extend the metaphor, the success of the harvest is directly dependent upon the care with which the seed is sown, and the crop tended and nursed until it reaches fruition. Definitions of "publicity" are many and varied; but an excellent description appeared in an electrical journal a short time ago:

> "Publicity signifies an attitude of mind as well as action; it signifies enthusiasm, energy guided into the right channels, concentrated effort for the general, rather than the individual, good—and, therefore, unselfishness."

Avenues for Development.

Perhaps it would be as well now to enumerate the various ways in which local publicity can be carried out. I will afterwards deal with each subject as briefly as possible. They are as follows: Local Press, showroom window displays, circular letter or postal canvassing, literature, hoardings, cookery demonstrations, health weeks, lectures, carnivals, sales weeks, exhibitions, parish magazines, competitions, reductions in price of gas, remembrance publicity.

Press Advertising.

In contracting for space in the local Press, endeavour should be made to secure what is known as a "solus" position, if possible—that is, one away by itself, and not hemmed-in by an assortment of heavily-leaded advertisements of all descriptions, which are so common a feature of many local newspapers, and which kill the effect of any decent advertisement, however carefully it may have been prepared. The use of a distinctive symbol in advertisements results in the added advantage of making them easily recognizable, and adds to their attractiveness, provided, of course, that the advertisement is at the same time well displayed.

The preparation of an advertisement is not the simple matter it seems at a casual glance. On the contrary, it is a highly specialized business, and many a valuable space is wasted by carelessly-displayed advertisements which ninety-nine people out of every hundred will not take the trouble to read. A common error is in trying to say too much. Many points can be made by inference quite as effectively as by a full statement. Remember that, as a majority of people do not buy newspapers to read advertisements, you must make your announcement stand out to attract their attention.

A few general observations on the preparation of advertisements may perhaps prove of interest to you, and helpful when you have occasion to draft advertisements for your undertaking's local publicity. A good advertisement may be said to do four things:

1. Attract attention.
2. Arouse interest.
3. Create desire to possess.
4. Ensure the decision to purchase.

Attention may be attracted by

(*a*) Illustration.
(*b*) Caption (or headline).
(*c*) White space.

While an illustration is not essential to the "pulling" power of an advertisement, it nevertheless frequently adds to its attractiveness; but it should be emphasized that, if an illustration is decided upon, it should suit the copy, and not the copy the illustration.

Blocks for the illustration of advertisements are of two kinds, half-tone and line; and the use of them generally depends upon the texture of the paper upon which the advertisement is to be printed. The former are reproductions from photographs or wash drawings, and the latter from pen and ink sketches. Half-tone blocks are necessary for printing on paper with an art or a smooth surface, and vary in respect of their "screen." The screen of a block is the "pin-head" effect produced in its manufacture; and its fineness is dependent upon the number of "pin-heads" to the square inch. These can be easily seen in a newspaper illustration, in which the screen is particularly coarse when photographs, for instance, are reproduced. For illustrating on newsprint and other coarse papers, line blocks are necessary. The "B.C.G.A." have a wide range of designs on all subjects, blocks of which can be obtained at practically cost price; no charge being made in respect of the cost of the original drawings.

So far as the caption is concerned, this, of course, depends to a great extent upon the copy, and can be either an actual part of the text, set in bold type, or a "catchy" phrase. It is a good practice to lift a line out of the text itself, which contains the gist of the subject, and, if necessary, contract it, as the caption should be brief and to the point.

Opinions differ as to the value of white space in advertisements, some inclining to the view that space is expensive, and should not be wasted, and also that a good copy writer should be capable of making an advertisement effective through the use of a strong caption and illustration. On the other hand, it cannot be denied that a good margin of white space does make an advertisement prominent.

Interest is aroused by the wording of the copy, which should receive careful attention. When writing copy, it is helpful to bear in mind that you are writing not for possibly thousands of newspaper readers, but to each individual. Copy must carry conviction, otherwise it fails.

Desire to possess. This stage of the appeal should demonstrate to the readers the benefits that will accrue from the use of the apparatus in question, and should consist of real selling talk.

Decision to purchase is the test to which the three other considerations are subjected, and it is upon this test that the success of the advertisement depends.

This is the frequent cause of advertisers' stunts—as, for example, the printing of a discount coupon, "money back if dissatisfied" guarantee, or "short-period" offers; but the advertisement should be strong enough in itself at least to bring inquiries.

Type.

The choice of type is a difficult question, and must depend to a great extent upon the fount possessed by the printer, as this generally is restricted so far as publications of a purely local character are concerned. The best course is to indicate, by a layout, the desired appearance of the advertisement, and leave it to the printer to follow as closely as possible.

Persistency is the secret of success in advertising; and while it is not often possible to trace business resulting from one particular advertisement, it is the cumulative effect of a well-devised and consistent advertising campaign which ensures the most satisfactory results. The national propaganda of the "B.C.G.A." prepares the way; and the gas undertaking that supplements this effort by local publicity will reap the greatest benefit. The "B.C.G.A." are always ready and willing to help and advise in these matters, and will, in fact, handle the whole of a local advertising contract from beginning to end, if desired.

It is always politic to cultivate good relations with the local Press. Of course, a consistent advertising campaign is an effective means to this end; but there are other opportunities which present themselves, of which it is worth while to take advantage. It is frequently possible to arrange for brief articles describing the activities of the undertaking to be inserted as news items. This is always good publicity.

Much can be said in favour of publishing advertisements of a topical nature, describing the history and growth of the undertaking, additions to its manufacturing plant, the amount of gas made, increased consumptions, amount paid in rates, number of men employed, and other such information which will give the public a closer insight into its working, and certainly tend to improve the mutual relationship.

Showroom Windows.

I do not propose to say much on the subject of showroom window displays, as this has already been discussed at previous meetings of the Circle, and will also receive attention at the final meeting of this session. There is not the slightest doubt, however, that a showroom window is a wonderful potential business getter; and here again a considerable amount of ingenuity is necessary if the maximum results are to be secured. The secret, as with Press publicity, is a regular change of appeal. There is nothing so deadening as monotony. The "B.C.G.A." provide at a nominal hiring charge a regular change of showroom window displays.

A well-lighted shop frontage after business hours has a strong advertising effect,

and enables a good window display to "work overtime," by attracting the attention of those of the public who do not have the opportunity of seeing the shops during the day. The practice of the large West-End firms illustrates this point. By such a lead, moreover, local shopkeepers may be induced to follow suit.

Postal Canvassing.

Postal canvassing is one of the chief avenues for local publicity, but one of the most neglected. It requires a good deal of foresight and careful organizing, if it is to prove a success; for it serves to bring your message immediately to the attention of the prospective consumer, where possibly other forms of advertising may fail. It is important for the success of any scheme of postal canvassing that the letters should convey an impression of personal correspondence, and not as being part of a general appeal. The letter takes the place of a personal interview; and this consideration must be kept in mind in its preparation. The proposals should be presented as much as possible from the consumer's point of view, which is the only sure way of securing interest. The paragraphs should be comparatively short, and the general appearance of the letter well balanced, with a good margin on either side. A distinct reference should also be made to enclosures. This can appear at the head of the letter or in the margin opposite the reference to them.

Of the two chief methods available for producing circular letters, the most satisfactory is the "Multigraph," which imitates typewriting. With care, it is possible to produce facsimile letters which it is difficult to distinguish from those individually typewritten. Particular attention should, however, be paid to the filling-in of each name and address, which is an essential part of any circular letter, but which will almost entirely destroy its value if carelessly done. Most local typewriting bureaux are able to supply such circular letters, but the "B.C.G.A." also possess the necessary equipment, and will be pleased to submit particulars to members interested.

A rather amusing reference to the subject of composing circular letters appeared in a business magazine recently, under the heading "How long does it take to write a circular letter?" "A man of ability might possibly complete the letter in a day; a man of ordinary ability could write it in half a day; and any fool could write it in half an hour."

Internal organization must be the basis of any scheme of postal canvassing. For example, the existing possibilities for securing new business should be established in the first place, otherwise a considerable and unnecessary amount of wasted effort results, as well as annoyance to the consumer, who is already using gas for the purpose to which the canvassing is directed. The Sales Organization Scheme prepared by the "B.C.G.A." provides not only for the censussing of the district, but also for the examination and recording of opportunities for business. This record is valuable to the undertaking, and acts as the starting point for any campaign.

Complaints.

I will interpose here a brief reference to complaints, which can be reduced to a minimum by a carefully-devised and regular postal campaign. The absence of complaints by no means indicates that your consumers are satisfied. There are no doubt many instances where gas appliances have been superseded through unsatisfactory service, where an inquiring canvassing letter would have elicited information as to the service being given by existing appliances, thus enabling the undertaking to rectify matters and, possibly, secure new business. The truism that the best advertisement is a satisfied consumer is in danger of becoming hackneyed through constant use, but it is too important to be overlooked when local publicity schemes are under consideration.

It cannot be too strongly emphasized that the completion of an installation should not be looked upon as the end of a transaction. It is essential that the matter be followed up at a later date, with a view to ascertaining whether the installation is giving entire satisfaction. This, with an occasional postal inquiry, will prove effective in the development of goodwill.

The literature question is closely bound up with postal publicity; and a piece of advertising literature should be enclosed with every letter sent out by the gas undertaking. If the subject be of only a formal nature, such as an acknowledgment, for which a postcard is sufficient, then the reverse of that postcard should bear an advertisement.

Of the two chief kinds of literature, a booklet is distinct from a catalogue in that it is written attractively in the endeavour to interest the recipient in the general advantages of the particular subject dealt with, while the latter contains actual details, illustrations, and prices of appliances, &c. There are two distinct methods of writing a booklet—it may be either brief, putting the facts concisely with little elaboration, or a fully descriptive story. Gas literature especially can be effectively written in either style; but it must be always borne in mind that literature takes the place, temporarily at least, of a salesman, without the advantages of personal contact he possesses, and that, in consequence, additional effort must be made in its preparation, to overcome this handicap. In one direction, however, literature possesses an advantage over the salesman in that it is consistent in its effectiveness. Once written, it continues to present its story with unfailing regularity, so long as it remains in circulation.

The general outline of the chief considerations in connection with the layout of advertisements, to which reference has already been made, applies also in principle to the preparation of a booklet. Illustrations contribute a great deal to its effectiveness, and help to relieve the otherwise heavy appearance of the printed matter.

Showrooms should be plentifully stocked with literature, preferably on tables at which consumers can sit, if their stay in the showroom is likely to be in the least protracted.

An essential point in considering these four primary avenues for local publicity is "concentration." For example, if the intention is to develop the sale of gas water heaters, then the Press advertising, showroom window displays, postal canvassing, and literature distributed should be co-ordinated during the period of the campaign. It is far better to focus the attention of the public upon one thing at a time than to generalize; and it is only necessary to put this theory into practice, to realize the pulling power of such a campaign.

Educational Propaganda.

There has been a considerable development in recent years in the direction of educational propaganda, particularly so far as local exhibitions and cookery demonstrations are concerned. Of course, the former calls for a heavy amount of detail work in organization; but excellent results are secured if the arrangements are carried through with thoroughness, and it will usually be found that the gas appliance manufacturers are willing to give their wholehearted co-operation to ventures of this description.

Competitions in cake or bread making, &c., add considerably to the attraction of gas exhibitions. Cookery demonstrations have come to be looked upon as an essential feature of any exhibition; but it is also becoming a common practice to hold a series of demonstrations, generally for a period of one week, in a suitable hall. Sometimes the undertaking's showrooms will be found suitable for the purpose, which is, of course, an added advantage. The demonstrator should work to a prearranged schedule; and a programme containing a note of the dishes to be cooked should be circulated with the invitations.

Local sales weeks also provide an excellent opportunity for the development of business. It is usual on these occasions to offer a small discount off list prices for appliances, and to fix them free of cost up to a stated maximum of piping, anything exceeding that amount being charged at cost. This practice, it might be mentioned, is often adopted during the period of exhibitions.

During local shopping weeks it is a frequent practice to arrange a procession of decorated cars in the cause of charity; and it is good policy for the gas undertaking, as an important member of the business community, to take its part. Considerable ingenuity has been exercised on occasions in the designing of these carnival cars. A "live" display is usually most effective—the gas being carried in cylinders. A good idea is to cook pastries during the procession, selling them *en route* for the benefit of the charity in question. The "B.C.G.A." have an extensive file of photographs of decorated cars of all descriptions, and, if desired, a selection of these will be forwarded as a guide to any undertaking.

In local health weeks a further valuable opportunity for educational propaganda occurs, particularly as health authorities and other influential local residents take a keen interest in them. The industry has a strong plank in the subject of smoke abatement and the allied question of coal conservation upon which to base its propaganda on these occasions; and these, coupled with publicity emphasizing the hygienic aspect of the use of gas, secure particular attention in such circumstances.

By no means the least valuable opportunity for education work lies in the direction of giving lectures before local institutions such as chambers of commerce and other organizations. We are apt to forget the wonderful story that lies in the manufacture of gas and the utilization of its many bye-products. The smoke abatement and bye-products section of the Gas Exhibit at Wembley bore ample evidence of the interest of this story to the public. In addition, there are innumerable industrial uses of gas which are well worth the telling.

Reductions in the Price of Gas.

On those occasions when the price of gas is reduced an opportunity presents itself for shouting the praise of gas from the housetops. A reduction in price is an event of some moment to a large proportion of consumers; and the gas undertaking should make every effort to ensure that the amount of money that nominally would be saved by consumers is expended with interest in the extended use of gas. A printed announcement of the proposed reduction should be circulated with the quarterly gas accounts, and also distributed by the meter collectors. The leaflet should carry a description of the various domestic uses for gas; and no effort should be spared to emphasize the increased advantage that consumers will secure from the greater use of gas appliances.

Outdoor Publicity.

The display of posters on hoardings is a particularly valuable form of local publicity. The poster is always working; its appeal is insistent, and, by its colour appeal and strength of display, compels attention and stimulates memory. The most striking points in its favour are that it is seen by everybody, it is an ever-present reminder of the position of your showrooms, and it has no waste circulation.

An important consideration, however, is the selection of sites. The best, of course, are those in the main shopping thorough-

fares, on station platforms, and at other places where people congregate. Street corner positions should be avoided. Posters quickly deteriorate from exposure to the weather, and care should be taken to ensure that they are maintained in good condition. In the case of contracts, this responsibility falls on the bill-posting contractor.

Further opportunities for outdoor publicity are provided by the gas undertaking's transport vehicles. Some undertakings go so far as to make use of their gasholders for the purpose.

Remembrance Publicity.

This term signifies the distribution of pieces of advertising material of a more or less lasting nature, as, for example, playing cards, book matches, calendars, diaries, &c., which are acceptable gifts, and, if judiciously issued, promote valuable goodwill, particularly among local officials, without necessarily being costly. This has been proved by the number of letters which the "B.C.G.A." have received from members, giving details of the appreciative thanks they have received from many of those among whom such material has been distributed.

Every endeavour should be made to cultivate good relations with local authorities and others who help to mould public opinion. Goodwill in these quarters is often invaluable, and its influence is apparent in unexpected ways in dealing with the public. Doctors particularly can be excellent salesmen of gas for heating, by installing gas fires in their waiting and consulting rooms.

In conclusion, it should be emphasized that the basis of any successful selling effort is essentially good service, which comprises the supplying of gas of suitable quality and at adequate pressure, the installing of the most economical appliances, and the constant maintenance of those appliances in efficient working order.

Discussion.

The Chairman remarked that the paper covered a wide field, and there was plenty of scope for discussion. Mr. Elson had given them a list of methods of publicity; and he (the speaker) queried the value of the parish magazine as a medium for advertisement. He had been interested in Mr. Elson's reference to the subject of composing circular letters, when it was said that a man of ability might possibly complete the letter in a day. This reminded him of a remark made by Mr. J. G. Clark, who, on presenting a paper, apologized for its length, saying that unfortunately he had not had time to write a shorter one.

Mr. F. R. Pickering (Rochester) said that Mr. Elson had given them a paper in which there was a mass of detail which would prove of great help to them all. In his opinion it was an excellent idea to have some device by which advertisements could immediately be recognized. For example, on every advertisement issued by his Company appeared a small silhouette profile of the district, underneath which was written "Gas Service." Consumers, by this simple device, recognized the Company's advertisements at once; and the local touch added to the interest aroused. Mr. Pickering laid stress on the selection of good type for advertisements. As for personal letters, much more could be done than was at present accomplished in this direction; and the "B.C.G.A." were ready to help any undertaking with this work. He thought that the gas industry was very much behind other industries and business firms in the matter of poster advertisement. Most of the posters issued were poor; and they could certainly do more at Rochester if good ones were available.

Mr. J. C. Walker (Hon. Secretary of the Circle) said that Mr. Pickering's remarks about posters were very much to the point. The whole thing was a question of money; and the gas industry was not willing to spend the necessary amount—it was not educated up to the use of posters. As a matter of fact they had not yet reached the stage when the industry as a whole was enthusiastic for advertisement. It was true that the cost of production was heavy; but he hoped the time would soon arrive when the industry would take such an interest that poster advertisement would become a real force in the publicity campaign.

Mr. Pickering suggested that it was a good plan in newspaper advertising to have a standard frame for the block.

Mr. W. H. Beckett (Gas Light and Coke Company), after referring to the help afforded by Mr. Elson's paper, said that, when undertaking advertisement work, they should decide beforehand to advertise those things which would yield a quick return. In his opinion the ordinary poster contained far too much detail. The fundamental characteristic of a good poster was that it aroused a desire to possess the means of attaining the comfort or beauty expressed. They should put a premium on their goods.

Mr. R. P. Ardley (Gas Light and Coke Company) made some interesting observations on postal advertising. Even with such work as calendar publicity they had obtained direct replies, resulting in the installation of 6 cookers, 8 water heaters, and 21 other appliances; the cash value of the whole being £119. It was necessary to know what apparatus the consumers had. They had recently canvassed many districts. For example, in the Kensington district they had dealt with 2238 addresses—equivalent to two years of one man's time. The direct result from this offer of service was the installation of 31 cookers, 12 water heaters, 268 ordinary heaters, and 129 miscellaneous appliances. In addition the examiner had brought in for overhaul 785 appliances—all of which were charged jobs—and maintenance contracts for 1507 stoves and 51 lights. Following this examination scheme, 50,000 letters were sent. If they received 1 p.ct. replies, this paid the expenses of the scheme; and the remaining 99 p.ct. produced indirect results.

Mr. W. A. Bishop (Croydon) remarked that they should take the public into their confidence, not as a favour, but as their right. It was necessary to have a sympathetic public opinion; and for this reason they should welcome complaints. Referring to Mr. Elson's list of the avenues of publicity, he said that at Croydon they made considerable use of the local Press, and found the 8-in. double-column advertisement the most suitable. Many "B.C.G.A." blocks fitted this space. In addition they had seasonal campaigns during which time they sent circular letters and held cookery demonstrations, &c. From parish magazines the results were very poor, but "remembrance publicity" was useful. He thoroughly agreed with Mr. Elson as to the use of good type. In the headlines of advertisements the word gas should be incorporated. A good advertisement said little, was simple, but impressed strongly. They should not disregard the value of light as an advertising medium. At Croydon they had recently fixed six lamps above the façia of a clothier's shop. As a result of the first week's use, the turnover of this consumer's business increased by £100.

Mr. J. Davis (Sutton) said that good publicity was essential, but its value was negatived if it was not backed-up by good service. He asked Mr. Elson what was his idea of the worth of kinema advertising.

Mr. E. L. Oughton (South Suburban) suggested that it would be a good plan if advertisements were inserted in the newspapers on a definite day each week. The public would then come to look for these on a particular day. As for parish magazines, in provincial districts these were often the means of retaining the lighting of churches, &c., or of re-equipping these buildings. It should be remembered that local publicity was local; and that what proved to be a good scheme in one district might be ineffective in others. Showroom window displays, for instance, should be designed to meet the conditions of the locality, and above all should be varied as much as possible. Mr. Elson had stated that literature possessed an advantage over the salesman in that it was consistent in its effectiveness. He (the speaker) suggested that nothing could take the place of a good salesman.

Mr. W. L. Westbrook (North Middlesex) emphasized the need for advertising such facts as that the use of gas resulted in a saving of labour. He supported Mr. Bishop in his contention that brevity was desirable in all advertisements. Postal canvassing, he thought, could be carried too far, till it became a nuisance. In his Company the meter inspectors distributed literature, and this was found to be beneficial. The use of rubber stamps on accounts, &c., was also of considerable value.

Mr. F. D. Medcalf (London) suggested that the use of distinctive symbols could be carried further than local advertising. For example, price cards could embody a symbol which would then link-up with local advertising.

Mr. A. J. Garward (Portsmouth) said that the main point of an advertisement should be incorporated in the catch heading, and the case should be stated with as much brevity as possible. When the advertisement appeared on a page on which there were others, it was advisable to give due consideration to the proper employment of white space. This was done at Portsmouth. There was no question that all undertakings should welcome complaints. Regarding poster advertising, he wondered whether the manufacturers of appliances had been approached with a view to co-operation with gas undertakings for this purpose.

Mr. R. J. Behenna (London) remarked that it was impossible for many consumers to visit the showrooms during business hours; and he suggested that it would be a good plan if the showroom window was lighted "after hours," and the price cards had catalogue numbers on them. The would-be purchaser could then write a number on his visiting card, which he could drop into the letter box. The inquiry could then be followed-up.

Mr. Walker, referring to Mr. Oughton's remark about inserting advertisements on definite days, said that this was all a matter of cost. Mr. Davis had rightly stressed the importance of having one's house in order before attempting to advertise. Good service was an essential. It was disheartening to realize that the industry spent only 0·002 p.ct. of their income on advertising; for there was no doubt that they would reap the benefit of more extensive and better publicity. All advertisements should be truthful; and over-statements should be made neither in conversation nor in the Press, otherwise the public would lose confidence in them. Experience proved that it was false economy to reduce advertising during busy periods. Advertising was like the fly-wheel of an engine—it absorbed a lot of energy in starting, but required much less to keep it in motion. Advertisement, he reminded them, was by no means confined to local newspapers. Everything that went out from the undertaking—from the human beings to the gas accounts—constituted an advertisement—good or bad. Everything in connection with a gas undertaking should be worthy of its policy.

The Chairman suggested that the use of good type and white space should be considered together, because it was the balance which made a good advertisement. Some advertisements seemed to have a peculiar air of distinction; and this indefinable but very real effect could only be achieved by artists.

Mr. Elson, replying to the discussion, agreed with Mr. Pickering as to the value of some distinctive symbol. The figures cited by Mr. Ardley were a complete justification of the plea for a carefully organized postal campaign. Referring to Mr. Bishop's remarks, the 8-in. double-column advertisement was the standard of the "B.C.G.A." He thought that it was good policy to support parish magazines, quite apart from the revenue secured. He had omitted to mention kinema advertising. The principles of this were much on the same lines as those applying to poster work. The message must be brief. Mr. Oughton's suggestion for a regular advertisement was governed by cost considerations, but would no doubt be applicable to local papers. In the showrooms a regular change of appeal was essential, but this was often a costly item for the small undertakings. It was for this reason that the "B.C.G.A." had incurred the heavy preliminary costs of various lay-outs, the use of which would enable any undertaking to have periodical changes. Circular letters must be produced carefully. Literature paved the way for the salesman, and covered the ground much more effectively than a salesman could hope to do. Circular letters should not be issued in a haphazard manner. Mr. Garward's experience of the benefits accruing from the welcoming of complaints pointed to the advantages of a more general application of the principle.

Gas and Teeth.—Salesmen who desire to know of the important part taken by gas in dental work cannot do better than investigate the contents of No. 133 of "A Thousand-and-One Uses of Gas," issued by the "B.C.G.A." A copy should be placed in the hands of every dental surgeon and others professionally interested in this work.

Midlands Circle.

A most successful Meeting of the Circle was held on April 8, in the Chamber of Commerce, Birmingham—Mr. G. M. Lewis in the chair.

SALE OF TOWN GAS AS AN INDUSTRIAL FUEL.

By H. R. Hems, Industrial Research Laboratories, Birmingham.

I think that insufficient movement is taking place in the gas industry with regard to the application of gas to industrial heating propositions. Much has been accomplished by the few enthusiastic undertakings who have taken up the question seriously, and I believe every one of them has been rewarded far beyond expectations for the efforts they have put forward. What has been accomplished by the few larger concerns can be done—though necessarily by obvious limitations to a minor degree—by the smaller undertakings, particularly those in manufacturing or industrial areas.

What are the possibilities of town gas for industrial use? Let us look for a moment at the achievements of those who have tackled the problem. In America in 1911, only 5 p.ct. of the total gas sold was used for industrial purposes; in 1921, this had risen to 25 p.ct. of the total output. In London, the Gas Light and Coke Company in 1923 supplied 10 p.ct. of the total output to factories and workshops. In Leeds at present the output for industrial purposes approximates 25 p.ct. of the total output; furnace consumptions alone being responsible for over 7 p.ct. In Smethwick, at March, 1910, the industrial consumption (including power) was 10·62 p.ct. of the total consumption; at March, 1919, this had risen to 33·28 p.ct.; at March, 1924, the figure was 41·10 p.ct.; and at December, 1924, the industrial consumption (including power) was 45·77 p.ct. of the total consumption (nine months' working). In Birmingham, at March, 1911, the industrial consumption for furnaces only was 5·06 p.ct. of the total; in March, 1918, it was 22·33 p.ct.; in March, 1924, it was 17·12 p.ct.; and to December, 1924, it was 18·72 p.ct. of the total.

Here are the actual figures of consumption obtained over a period from a standard type of oven furnace installed for the annealing of brass pressings. The furnace is 36 in. deep, 18 in. wide, and 12 in. high (internal working space), and deals with approximately 14 cwt. of work per 8-hour day (including "getting-up" period) for an average gas consumption of 1·81 c.ft. per lb. of work annealed.

		Cents.	
1923.	Midsummer quarter	3·5	
,,	Michaelmas ,,	118·4	Furnace installed
,,	Christmas ,,	116·5	
1924.	Lady Day ,,	114·8	
,,	Midsummer ,,	110·3	
,,	Michaelmas ,,	113·6	
,,	Christmas ,,	133·6	
1925.	Lady Day ,,	124·7	

In setting out for new industrial business, we have three main points to consider:

1. The prospective customer—who may, of course, already be a consumer—and his requirements.
2. The appliance manufacturer and his apparatus.
3. The gas undertaking and its service facilities.

With regard to the prospective consumer and his requirements, however you may have received his inquiry, it is necessary to visit his works to ascertain present methods and also to discuss the possibilities of gas fulfilling his requirements satisfactorily and economically. Use every endeavour to gain his confidence, and listen carefully to all that he has to say on the particular process in question. It may appear very simple to replace his existing methods with up-to-date gas apparatus; but remember that your man may have a life experience behind him, and there are many pitfalls in some processes which need watching for.

I think it can be truly said that the majority of gas undertakings owe their industrial loads to the furnace and industrial apparatus manufacturers. This is not as it should be. So far, most of the experimental work has been carried out and the cost borne by them; and I think that gas undertakings will have to do much more of this work in the future. An apparatus manufacturer only has interest in a furnace or similar apparatus up to the point of sale, whereas to the gas undertaking the appliance is going to be a continual source of income so long as it is maintained in good order, as will be seen from the figures already quoted.

Last, but most important, we have to consider ourselves in this question. It is assumed we are prepared to provide a supply of gas of a constant calorific value at a good steady pressure. The rest of the matter is in the hands of the representative of the gas undertaking who has the industrial business in hand. Regarding the man himself, in my opinion he should be a combination of an engineer and a salesman. If this can be obtained in one man, all well and good; but if not, then possibly two separate men, each possessing qualifications in his own branch, may be required. In any case, whoever handles the proposition needs to study his consumer, be capable of dealing with the apparatus manufacturer, and also know his own undertaking and its methods of service in this direction. He must possess common-sense and tact to a very large degree. I know this is necessary in dealing with the domestic consumer; but with the prospective industrial consumer it is even more essential, because all industrial consumptions legitimately obtained to-day are a matter of facts and figures, not fads and fancies.

May I be permitted to outline a scheme to you which I think is elastic enough for application to both small and large undertakings? I suggest that a man possessing some qualifications for the work be appointed to deal with industrial consumptions either entirely, if the possibilities justify it, or partly with other investigational work. He should study the trade of the particular district, and then arrange for a canvass of all the manufacturers with a view to ascertaining what processes are carried out in the works visited, and putting forward the claims of gas as a fuel. This visit should be preceded by a letter enclosing a copy of one of the "Thousand-and-One Uses for Gas" dealing with applications of particular interest to the manufacturer, or one of general interest.

If the premises visited are already partly equipped with gas apparatus, this visit is a good opportunity for inspection of the existing plant and the putting forward of any proposition which may mean increased efficiency and economy for your consumer. It also affords facilities for taking details of this plant with a view to compiling a special record of industrial consumers and apparatus.

Having obtained the interest of the manufacturer, the question of demonstration of the suggested gas apparatus becomes of importance. This is one of considerable difficulty even to the larger undertakings, for it is not possible in a well-equipped industrial demonstration room to show every type of furnace or apparatus. Much, however, can be accomplished with just one or two standard types; and as gas is coming more and more into use as an industrial fuel, it should be possible to arrange exchange visits between gas undertakings for inspection of particular types of apparatus, the "B.C.G.A." being the medium through which an undertaking might ascertain where plant to suit their particular requirements is installed.

After installation of the plant, a periodical visit of inspection should be made by the industrial representative, and if possible necessary repairs carried out by men employed by the gas undertaking. If you can possibly keep the personal visit up, do so by all means—a manufacturer likes to feel that you have his interests at heart.

Muffle Furnaces.

Muffle furnaces are used in the smaller sizes from 6 in. by 4 in. by 3 in. to 30 in. by 18 in. by 12 in. for all kinds of jewellers' work, including the annealing of gold and silver, assaying, and jewellers' enamelling work requiring definite heat control and radiant heat only, without products contact. These furnaces are especially suitable for the heat treatment of delicate carbon-steel tools such as gauges, &c., where freedom from scaling is sought. They are most satisfactorily heated by low-pressure burners (except where quick heating is desired), either in the form of a row of small units supplied from a burner rail and playing centrally along the under part of the fireclay muffle lining, or by one or two units of the ring burner type depending on the size of the furnace.

The following particulars of three standard sizes of muffle furnaces give an idea of gas consumption.

Size of Muffle—	C.Ft. per Hour.
6 in. deep by 4 in. wide by 3 in. high	40
14 ,, ,, ,, 8½ ,, ,, ,, 3½ ,, ,,	100
30 ,, ,, ,, 18 ,, ,, ,, 12 ,, ,,	300

The larger sizes of muffle furnace are now of the recuperative or regenerative types and are used for enamelling small articles in large quantities, such as gas burners, or large iron plates. They are also employed for the heat-treatment of special alloys where very delicate adjustment of temperature and atmosphere is required. One furnace we have installed in Birmingham on this principle, having a muffle 7 ft. by 3 ft. by 18 in., used for gas burner enamelling, and running continuously day and night, has a consumption of about 600 c.ft. per hour, with regular door openings for loading and discharging.

Oven Furnaces.

This type of furnace is more used than any other. In its smaller sizes it takes the place of the old-fashioned hearth for the heating-up of carbon-steel tools, &c., for hardening purposes, and will also deal with small quantities of annealing or case-hardening. Gas-heated oven furnaces range in standard sizes from 12 in. deep by 9 in. wide by 6 in. high up to 36 in. by 24 in. by 12 in. (internal working space). They are most satisfactorily heated by low-pressure gas, and there are three or four very good designs on the market eminently suitable for heat-treatment operations requiring temperatures up to 950° or 1000° C.

The following are details of one or two standard sizes of oven furnaces:

Size.	Maximum Consumption.	Maintaining Consumption for 800° C.
	C.Ft. per Hour.	C.Ft. per Hour.
12 in. deep by 9 in. wide by 9 in. high	180	100 to 150
24 in. deep by 18 in. wide by 12 in. high	300	200 to 250
36 in. by 24 in. by 12 in. or 15 in. high	500	300 to 400

Great care should be exercised in advising a consumer to instal the larger sizes

of power furnace. They are satisfactory where short period heating (8-hour working day) is desired, or quick reduction of temperature at the conclusion of an operation is required. If the proposition is a long-period or continuous-heating one, consideration must be given to furnaces designed with continuous counter-current recuperators of either firebrick or metal, or the regenerative type.

Should temperatures higher than 1000° C. be required, recuperative or regenerative furnaces must be used for either muffles or ovens.

Forging Furnaces.

Into this category would be placed all patterns of furnace in which a flame is playing directly into the working hearth, and is in contact with the work to be heated. These furnaces are usually heated with a gas and air blast burner supplied with gas at ordinary town pressure and air at from ½ to 2 lbs. per sq. in., as this method provides a rapidly-obtained high temperature in the working chamber, and a high rate of transference of heat to the work to be treated.

The work would include that of high-speed steel hardening requiring a temperature of about 1260° C., normally in a comparatively small space. This form of furnace is usually made with a preheating chamber. A furnace having a chamber 6 in. by 6 in. by 6 in. would be heated to a temperature of 1300° C. in 20 to 30 minutes with a gas consumption of approximately 200 c.ft. per hour; a blower capable of dealing with about 1500 c.ft. of air per hour being required to supply the air.

Small furnaces of this design are also employed for the heating of small brass billets for hot stamping work. Bigger furnaces are used for the treatment of large sizes of high-speed tools, and also for the general forging operations of steel blanks into various shapes, and the production of nuts and bolts. In the manufacture of the latter, the following figures may be of interest. Over a two days' test, a gas consumption of 15,000 c.ft. per ton of nuts and bolts was found to be required, which, with gas at 2s. 4d. per 1000 c.ft. *less* 5 p.ct. (Birmingham price) would amount to £1 13s. 3d. per ton.

Melting Furnaces.

The next big field for the utilization of town gas as a fuel lies in the development of the melting furnace. A great deal of useful work was accomplished a few years ago in this direction; many firms and several gas undertakings obtaining some very fine results. It is a pity that, since the war, gas prices have so much increased that at present we cannot obtain any consumptions for ordinary brass-casting or similar furnaces. With aluminium melting, the position is brighter, especially since the use of the cast-iron pot for remelting came into general use. Very little consumption for this process was lost even during the period of highest price. Tin, lead, and soft metals generally are most successfully melted with gas; and costs compare favourably with other forms of fuel. The following figures will give you an idea of the costs of melting various metals:

Brass, 4 c.ft. per lb. (in small quantities)	Approx:	9,000 c.ft. per ton
Gunmetal, &c., 5 c.ft. per lb.	,,	11,000 ,, ,,
Aluminium	,,	8,000 to 9,000 ,, ,,

For brass melting consumptions to be regained and retained, gas needs to be sold at about 1s. 6d. per 1000 c.ft.

I wish to thank the Birmingham Gas Committee and Dr. C. M. Walter, Engineer-in-Charge of the Industrial Research Laboratories, for permission to read this paper, and for the use of information obtained in the course of my official duties.

Discussion.

Mr. G. M. Lewis believed that in every town there was some field for industrial heating to which gas could be applied. He instanced such apparatus as glue-pot heaters, soldering-iron stoves, blowpipes, and hot water for sports pavilions, as some of the processes which would almost invariably be in existence within the area of every undertaking. Mr. Hems' figures showed a great extension in the use of gas for heating within recent years, but he felt sure that a vast consumption was as yet untouched. He agreed that the manufacturers of apparatus had done a great deal to assist in the development of gas sales, but felt that it was the duty of the gas undertakings to advise consumers, push the sale of the right appliances, and fix and maintain them.

Dr. C. M. Walter (Engineer-in-Charge, Industrial Research Laboratories) emphasized what Mr. Hems had said with regard to service. He considered that with industrial consumption this was of paramount importance. Speaking of furnace repairs, he said that all furnaces were subject to wear, owing to the high temperatures employed; and replacements of parts were necessary. The manufacturers of furnaces catered well for these replacements, but the difficulty was that the jobs were usually wanted very quickly, and he considered it necessary to have a skilled man always available to carry them out. Every opportunity for repair or adjustment was an opportunity for possible improvement, such as alteration in refractory material, &c.; and thus the user was kept satisfied. Dr. Walter agreed that there were opportunities for an industrial load in every undertaking. A complete canvass would be sure to discover some consumers; and this business, once started, would grow when the value and efficiency of gas heating were more fully realized.

Mr. G. Burden (Redditch) congratulated Mr. Hems on his paper. He had told them not only how to set about getting business, but what to do when it was obtained. At Redditch they had recently sent a letter to about forty factories asking for opportunity for examination and maintenance of their apparatus. The results were proving most satisfactory, and gave an opportunity for getting into personal contact with the consumers. Small undertakings found themselves in difficulty because they were unable to employ a man who could specialize exclusively in this class of work. He suggested that some sort of advisory and consultant board in the Midlands would be most useful to the smaller undertakings. A demonstration room was almost a necessity if new business was to be obtained.

Mr. J. A. Davis (West Bromwich) raised the question of competition with producer gas for annealing purposes.

Mr. S. W. Simmons (Dudley) stressed the necessity of first gaining the confidence of the consumers. All figures given of costs and consumptions should be conservative and capable of attainment under ordinary working conditions. He advocated the sending of a letter before a call was made, but thought that letters, circulars, &c., were of very little use unless followed-up by a personal call. He spoke of the use of gas for metalizing processes in Dudley.

Mr. J. Pemberton (Stoke-on-Trent) said that in the Potteries their need was for a satisfactory method of heating large furnaces of a size approximating to (say) 6 ft. by 10 ft. by 4 ft. Experiments made on small furnaces were of little use unless the results could be translated into terms of large furnace working. He believed that these large furnaces could be successfully designed and economically worked; but the trouble was the high first cost. Manufacturers were disinclined to put down the large amount of money necessary on a process in which gas had not been previously used, and which they looked upon as somewhat in the light of an experiment.

Mr. Hems, replying to the discussion, mentioned the improvement that had been made in the construction of the soldering-iron stove. He thought it possible to deal with the large furnace work mentioned by Mr. Pemberton. Unsuitable apparatus was the bugbear of the whole furnace business, and caused endless trouble.

Mr. T. B. Armitage (Cheltenham), in proposing a vote of thanks to Mr. Hems, stressed the necessity for co-operation between the smaller towns in dealing with industrial work.

Mr. Pemberton, seconding, deplored the small number of students in the gas industry, and thought that any interest that could be aroused among the children and teaching authorities would be of great value.

At the close of the meeting many of the members visited the Gas Department Stand at the National Trades Exhibition at Bingley Hall.

Scottish Circle.

A meeting of the Circle was held in Edinburgh, on Wednesday, April 8. The President (Mr. Jamieson, Assistant Gas Engineer, Edinburgh) was in the chair.

MAINTENANCE OF GAS APPLIANCES.

By W. S. Anderson, of Perth.

It is impossible to get a department in which there will not be complaints from the consumer as to consumption of gas, want of supply, or faulty appliances; but, if these complaints are attended to with promptitude and courtesy, it may be—as has frequently happened in our department—that, instead of doing harm, it will actually help.

One of the most valuable assets we have is a bond of sympathy between the consumer and the gas department—in fact, the consumer is the best publicity agent we have, especially in a provincial town like Perth. The aim of the salesman should always be to foster that spirit by tactful dealing with the consumers. Such a spirit has existed in Perth for many years. Of course, the gas department have been very generous in respect of terms of hire of apparatus. We supply all domestic sizes of cookers and fires at the small hire of 2s. per annum, fixing free up to 30 ft. of pipe from the meter. Radiators, geysers, water heaters, and wash boilers are hired at 4s. per annum; the consumer paying for the water connection only. Smaller articles—viz., hotplates, rings, and irons are given at 1s. per annum. We do a considerable business in hire-purchase of such articles as are outside the usual hire rates—viz., new cookers, circulators, and any special appliances. These we give in fifteen payments over a period of five years. We have in Perth 11,536 consumers, and nearly 15,000 articles out on hire (cookers 5200, fires 2350, water heaters, geysers, and boilers 700, small appliances—hotplates, irons, and rings—7000).

Our responsibility ought not to cease with the supplying and fitting-up of appliances, even though these are fitted by our fitters, and not by outside plumbers, as is the case in many towns. Without proper instructions the appliance may not give the results it ought to, and may be blamed unjustly. Therefore maintenance is a necessity. This is specially applicable to gas fires. We carry out periodical inspections of all appliances; and should we discover any cooker or any other apparatus which we consider in need of an overhaul, we bring it into our workshops, have it attended to, and return it to the consumer almost as good as new. In the interval we loan a hot-

plate. In connection with the aforementioned survey, inspection cards have been prepared showing all the appliances that each consumer has in use.

In the matter of showrooms, we have been a little unfortunate in Perth, owing to the situation being in a back street where there is little regular traffic. A good showroom in a central position would be a great asset to us in Perth. However, we are doing our best with the material in our hands. Pendants, brackets, glassware, and all classes of shades, &c., in addition to cooking and heating appliances, are displayed. The customers are not pressed to buy; but should they desire anything, we pass the order through their own plumber or ironmonger, as some years ago an arrangement was made with the gasfitting trade to allow them to use our showrooms. This has proved fairly satisfactory; but as many of the ironmongers have still continued selling cheap and shoddy burners, &c., we decided to sell direct to the customers, if desired. At the beginning of January we appointed two new maintenance inspectors, who are doing door-to-door work, cleaning and overhauling burners, &c., and only charging for the material used. In re-introducing the maintenance inspection, we are only going back to work we did many years ago in the days of the flat-flame burner.

To my mind there is not nearly enough attention paid to the lighting of houses and schoolrooms, especially when we hear so much to-day from our medical men of the injury done to the eyesight of children through bad lighting. An expert, writing on this subject some years ago, said: "Good light is of vital importance to the adult in his daily occupation, but still more so to the child at school or in the nursery. It is therefore the duty of parents to see that any reading or fine work undertaken by the children during the evening is not done in gloomy, ill-lighted corners of the room. While reading at home is optional, study at school is compulsory. How much greater, therefore, is the responsibility of school authorities to see that the school rooms are well lighted. Medical authorities tell us that a progressive deterioration in eyesight occurs during school life. We can readily understand why this should be the case, for a child working by insufficient light instinctively tries to bring the book nearer to his eyes, or bends so as to bring his eyes nearer the work. This constant close vision is believed to be one of the main causes of short-sightedness. Moreover, the habit of assuming a stooping attitude is bad for the child. Children are sometimes blamed for such habits; but are we sure that the blame should not rest on their elders for allowing bad conditions of illumination to exist, and so paving the way for the stooping habit?"

It is of utmost importance that we of the gas departments do our part to prevent the charge being made against us. We certainly need an A.1. nation, if we are to hold our own in the world's struggle. This is not possible with stooping, short-sighted children. Homes must be well lighted; and gas alone can do it. Some time ago the "Lancet" had the following remarks: "For some not very clear reason the light of the electric lamp seems to be wearying, taxing the eyes; and a good many people complain that reading by electric light gives rise to headache." The experience of one authority had proved that electric light did a large amount of serious harm to the eyes.

We have recently re-fitted two schools; and the results have been very satisfactory. During this season we re-fitted a large church, using superheated burners. Those interested have expressed themselves as delighted with the result. We also installed semi-indirect fittings, with distance control, in a hall. Though estimates had been lodged for electricity, the authorities decided to make no change. I believe that much could be done by pushing distance lighting for houses, especially when maintenance is in force. I have had a pneumatic switch in use in my own house for fifteen years, with good results—in fact, there has been no trouble whatever. In one of the rooms I use two switches, one at the door and the other at the bed. The pneumatic switch is specially useful in lobbies and halls; as it saves a light being on all night when it may only be required two or three times.

The doctors in Perth favour gas fires; and nearly all have them in their consulting rooms and throughout their houses. We are also on good terms with all the architects in the city. In the housing schemes cookers and wash boilers are being installed in all the houses; and in many cases fires are being fitted as well. All the Institutions in the city are heavy consumers of gas, especially the Royal Infirmary, where most of the cooking is done by gas. At present we have an inquiry on hand to instal a large cooking range to substitute the present coal range. When this is carried through, all the cooking will be by gas. They have gas hotplates in all the ward-kitchens, and all the sisters' rooms have gas fires. About a year ago a new outpatient department was built. This is fitted with gas; a circulator being installed for the water supply. Most of the hotels and restaurants use gas for cooking, and all the smaller halls and many of the churches in the city are heated by gas-steam radiators.

During the last two years we have gone over nearly the whole of the city, and renewed the services street by street, employing five squads of men to do the work. Already we are reaping the benefit in the reduction of complaints.

Discussion.

Mr. SIMPSON (Greenock) said he thought Perth had an excellent record in regard to the number of articles on hire in proportion to the number of consumers. The gas department should have complete charge of all the internal fittings. Attention should be paid to the lighting of schools and churches. In Greenock during the past year they had fitted over 800 new boilers on the maintenance system. He felt it was really worth while increasing the staff of maintenance men.

Mr. N. S. SMITH (Greenock) said a well-organized maintenance system was the undertaking's best method of building up goodwill. A maintenance inspector should be something more than an ordinary fitter. He should be a good salesman. A "handy" man could be trained in a few weeks in the art of cleaning and adjusting burners, cookers, fires, &c., but he might never become a maintenance inspector in the full sense of the word, because he was not temperamentally suited for the job. The duties of the maintenance man should be to instruct the consumer how to get the best use out of the appliances, and how to keep them in order—one demonstration in a hou should be sufficient. He should also do a minor adjustments, take a census of all a pliances on the premises, see that the servi meter and fittings were adequate, and e deavour, in a judicious manner, to introdu new business.

Mr. GRAHAM (Kilmarnock) asked if the was any limit to the value of the article su plied free.

Mr. ANDERSON replied there was not, if th article was considered necessary. Nor wa there any guarantee needed of consumption.

Mr. GRAHAM said he should be disincline to hire on those conditions. He would put limit on the value of the appliances, or find the consumption was going to repay them He thought it was a good thing to put th maintenance cost on the price of gas.

Mr. GAVIN (Galashiels) remarked that on of the most valuable assets was that bond sympathy between the consumer and the ga department. It was desirable to have a understanding with the local Press.

Mr. DOW (Galashiels) thought that plumbe regarded gas fitting as a side issue. N plumber should be allowed to put in any ga fitting until he had passed a qualifying test- when he knew what size of pipe would carr a certain quantity of gas for a given purpos The price of gas appliances to-day did n warrant the small hire charged at Perth. would be twenty years before the capital re presented by these appliances was repaid, an by that time they would be worn out. Galashiels they were very fortunate in havin a showroom in the main street. They di good business by advertising in the loc Press and by keeping their showroom lighte till eleven o'clock. Gas fires ought to b pushed only in conjunction with industrial ap pliances, to avoid peak loads.

Mr. TAIT (Edinburgh) said that geyser were put out on hire, but the householder ha to pay for the fitting.

Mr. CHISHOLM (Leith) said that in Edin burgh they made periodic inspection of ga fires only. They made a charge for exchang ing cookers.

Mr. DARLING (Cowdenbeath) spoke i favour of a free maintenance scheme. Th advertisement alone was worth it. Windo displays brought very good business. At Cow denbeath they kept the lights burning ti eleven o'clock.

Mr. G. KEILLOR (Greenock) suggested tha gas fires in hospitals should be inspected an put in order every month or six weeks, be cause, when the beds were made, there wa always a lot of fluff flying about. It was thei business as salesmen to become friendly wit plumbers, and teach them what was wante in the way of service and piping.

Mr. DUFF (Edinburgh) said the questio of maintenance was becoming one of the mos important in the gas industry. He would lik to have a copy of various systems of mainte nance work exchanged between towns of equa size.

Mr. WILSON (Edinburgh) maintained that unless they made periodic inspection, the could not get proper efficiency. In Edinburgh many houses were being divided, and they ha no difficulty in getting architects and plumber to instal pipes of the proper size.

The PRESIDENT remarked that skilled me only should be put on maintenance work.

Gas House-Heating Contest.

A New England Scheme.

The Gas Sales Association of New England (with the help of friends of the industry who are anxious that it should secure the maximum business benefits from gas heating) are offering a series of prizes in connection with what should prove highly valuable competitions.

There is to be a first prize of $100 and a second prize of $75 for New England gas company employees presenting the best reports for use by others as sales helps during the summer and autumn in obtaining new heating installations. This contest closes on May 1.

Then first and second prizes of $100 and $75 respectively are offered for the best window displays of heating equipment made between now and October. For the purpose of deciding the competition, photographs with descriptions not exceeding 500 words are to be submitted. There is no limit to the number of photographs or displays that may be submitte by an individual company. The prize will be awarded to the commercial depart ments of the winning undertakings, to b distributed among their salesmen.

Two prizes of $50 each are offered fo the sale of the most heating equipmen during 1925—one to be awarded to a com pany with a heating rate of less than $ per 1000 c.ft., and the second to a com pany with a rate of $1 or over. The number of installations per 1000 meter and the total sales value of the installa tions made are both to be taken int account in making the awards. The sale value will include gas piping, flue piping and thermostats, where these are em braced in a lump sum price of equipment sold ready for use. Among the apparatus to be considered as heating equipment ar steam, vapour, and hot water boilers, hot air furnaces, radiators, and gas fires, pro vided they are permanently installed wit rigid connections. In this case, also, th prizes will be awarded to commercial de partments.

West Riding of Yorkshire Circle.

A Meeting of this Circle was held at he Town Hall, Ossett, on April 8, when n interesting paper on the importance of he gas salesman was read by Mr. A. E. Iottram, Engineer and General Manager o the Ossett Corporation Gas Depart- ient. There was a very good attendance f members from all parts of the Circle's rea. Mr. S. H. Packer (Bradford), the 'resident, presided over the meeting.

Prior to the business proceedings the nembers were entertained to tea by the Ossett Gas Committee, and the gathering ncluded the Mayor (Mr. D. Ellis) and the Chairman of the Gas Committee (Mr.). B. Broadhead).

Mr. Broadhead, on behalf of the Gas Committee, offered a brief but warm wel- ome to the members of the Circle, and ex- ressed the hope that their meeting would e successful and beneficial.

The Mayor, offering a welcome on be- alf of the Town Council, said he was atisfied that there was a great future be- ore the gas industry. He noticed from nnual reports that in most gas under- akings the consumption was steadily in- reasing; and he wished the gas industry nd those engaged in it all prosperity.

The Chairman thanked the Mayor and Mr. Broadhead for their welcome. The olicy of the Circle this year was to stir up he enthusiasm of the gas salesmen in the maller undertakings; and the attendance t the present meeting certainly spoke well or the interest of the salesmen of the Vest Riding. He moved the hearty thanks f the gathering to the Mayor and Cor- oration, the Gas Committee, and Mr. Iottram for their hospitality.

Mr. C. Watson (York) seconded; and he motion was carried unanimously.

Between the conclusion of tea and the pening of the business meeting, the nembers inspected the showrooms of the Ossett Gas Department.

Mr. Packer presided over the subsequent neeting, and remarked that it had been is pleasure to welcome many gas ngineers to their meetings. He had great leasure in introducing Mr. Mottram, who ad a keen sympathy with the objects of he Circle.

THE IMPORTANT POSITION A GAS SALESMAN HOLDS TO-DAY.

By Arnold E. Mottram, Engineer and General Manager, Ossett Corporation Gas Department.

Gas engineers have for years concen- rated to a large extent upon improving he gas-works; vast strides have been nade—retort houses are practically per- ect, and capable of turning out an un- imited quantity of gas; mains have been un throughout the country; distribution as been well studied, and every house has service available. The manufacturers of as appliances have done their part mag- ificently. Think of the efficiency of the as engine of to-day, the gas-heated steam oiler, the cooker, the wash boiler, and the re. We have the gas, we distribute it ell; and we have the appliances for con- uming it. We now desire to link-up the onsumer and the appliances. This, I take t, is your work.

Gas is a household word, a household ecessity, with a future bright with pos- ibilities. Have you all got the qualifica- ions for the positions you hold? The first ne that comes to my mind is that you hould have the happy knack of winning he confidence and goodwill of the cus- omer. You should be alert without being 'cheeky;" you should be bright and speak learly and with confidence. For this it vill be necessary for you to have a good nowledge of the appliances you are sell- ng. This does not by any means com- plete your education. Do you find your work interesting? If so, you are bound to get on. If, on the other hand, you are simply passing your time away in the showroom, until something better turns up, I am afraid you are doing more harm than good. You want to know when not to sell an article, as well as when to sell it. If you are satisfied the appliance is wrong for the work it has to do, you must refuse the business. You will have lost one sale, but will have prevented a bad advertise- ment which would probably have lost a score of sales.

The sale of gas for power is good busi- ness for both the buyer and the seller. In many small workshops a steam boiler is put in because a small quantity of steam is wanted. A gas engine might be put in, and the waste heat from the exhaust used to generate the steam. Waste-heat boilers can now be obtained for this purpose. The gas cooker of to-day is an ornament to any kitchen, as well as being far away the most serviceable article for the purpose. The gas boiler has done away with the dirty, nasty set-pot, which in the olden days drove many a poor washerwoman to drink. Gas fires have been perfected, and are suit- able for all requirements. They are very important labour-savers. A gas fire in a bedroom, lighted for twenty minutes be- fore you retire, will ward-off many an ill- ness.

Incandescent gas light is the cheapest illuminant, and certainly best for the eyes. Its ventilating qualities give it an advan- tage over other methods of lighting. When one thinks of the thousand-and-one gas appliances which the gas salesman must know all about, one realizes that his qualifications should cover a wide range. You have great scope for your energy. Endless business is waiting for you.

I saw in the paper the other day an argu- ment as to whether it was the common practice for the husband to get up first in the morning, and do the dirty work of lighting the fire, or whether it was usual for the wife to do so. I should imagine that it must be usual for the wives to light the fires, because I think that if a man did it for two or three mornings, he would use up all the bad language he knew, and would then call at the gas showroom and order a gas fire. Do you not think that a guessing competition, as to who lights the fire, would be a good advertisement for gas, and bring home forcibly to the one who does light it the waste of time and temper spent on a coal fire?

Think of the large number of consumers who never come near the showroom. They must need gas appliances. Surely you are not going to lose their custom? How do you propose to secure it? If they do not come to you, you will have to go to them. If you were to take a lorry load of samples with you, it is certain you would book a lot of orders.

The smoke nuisance is a topic widely dis- cussed. You have a grand opening here, for you have the means at hand for greatly reducing this bugbear.

I have no fault to find with electricity in its proper place. It has its uses; but I think it derives some of its light from blushing at some of the things claimed for it. I will just mention one point, which puts it in its proper place in comparison with gas. Mr. D. Milne Watson, the Governor of the Gas Light and Coke Com- many, recently stated that his Company alone produce in a year as much energy for light, heat, and power as is produced in the form of electricity by the whole of the electrical undertakings in Great Britain. He also stated that his Company sent out last year 183 million therms, for which the consumers paid £6,000,000. To replace this gas by electricity, at the same total cost to the consumers, the electricity would have to be sold at ¼d. per unit. Last year's average price of electricity for all purposes, totalling the whole of the country, was 2d. per unit, so you see how much cheaper gas is than electricity.

We hear that the Government are likely to give the electrical industry £50,000,000. I am sorry for the receivers—they must be in a hopeless state. The givers will naturally have some control. We have seen in the past the dire result of Govern- ment control of industry; and if the pre- sent electricity works, which are not yet paid for, are to be scrapped to make way for more costly ones, the first £50,000,000 will not go far. This money will have to be paid back with interest by somebody.

It looks as if the electricity consumers will have to pay twice over for what they use—once through their electricity bills, and a second time through their rates and taxes. A sum of 50 millions is equal to an increase in income-tax of 1s. 6d. in the pound for twelve months. In this way people are told they are going to have cheap electricity.

Electricity works are very wasteful users of coal. Only 10 p.ct. of the coal used in the boilers is sent out of the works in the form of electricity; 90 p.ct. goes up the chimney and is wasted on the works. The new super electricity works which are to be built are to waste 80 p.ct. of the coal. These are their own figures; so you may be sure they are the best they can hope for. On the other hand, gas-works send out in the form of gas and residuals 75 p.ct. of the coal they carbonize, and only waste 25 p.ct. in the process of manufacture.

We at present charge 4s. per 1000 c.ft. for gas for domestic lighting. Electricity for the same purpose is 6d. per unit. Taking the best ordinary inverted gas burner, and the best electric lamp, the householder of this district who has adopted electric light is paying for his elec- tricity equal to 8s. per 1000 c.ft. of gas, light for light. Not only this; he is pay- ing in his 6d. a unit a large part of the bills of the large electricity consumers, who are getting current for about 1d. per unit.

I do not think we need waste much time in considering the heating of the house by electricity. The cost is prohibitive, and from a health point of view electric heating is bad. A gas fire in the grate assists ven- tilation; but the electricians' method is to place electric heaters about the room, stab the people in the back with a ray of heat, and at the same time poison them with their own breath, for it is impracticable to place a fan in every room.

In conclusion, I do not think your pre- sent value is permanent. You have such a wide scope before you that you should rise to become the most important branch of the gas industry.

Discussion.

The Chairman said they were all deeply in- debted to Mr. Mottram for a helpful and en- couraging paper.

Mr. C. Watson (York) remarked that the gas salesman was different from the majority of salesmen of other businesses. In the latter case the salesman sold what the customer asked for, and as much more as he could get rid of. The gas salesman had to sell what the customer really needed; and this did not necessarily mean the exact article asked for. The gas salesman must understand what his various appliances would do and would not do, and he must ascertain the requirements of the customer, and try to sell the appliance which would give the best results in service. Sometimes it needed a great deal of tact to persuade a customer that what was really wanted was something different from that re- quested. The gas salesman had to study human nature closely, and learn to understand the peculiarities of the customer. Mr. Watson said he believed in encouraging people to bring their complaints, so that they could be dealt with and remedied. Very often, by so doing, obsolete apparatus could be replaced. In any case, the salesman got into closer touch with the customers, and could introduce new and better types of apparatus, and could

take measures to ensure a better service. There was a good deal of shoddy gas apparatus being sold; and it would pay the gas departments to buy up at a low price old apparatus of which consumers were complaining. There was an old question—whether a gas salesman was born or made. He thought the salesman was born, but had to be educated to his particular business. When customers found that the department were anxious to give the best possible service, more business resulted. The gas salesman's work involved continuous interest in consumers' needs. Lighting was still a factor which counted for a great deal. In the matter of obtaining new business, Mr. Watson suggested that gas inspectors should get into touch with architects, builders, clerks of works, prospective occupiers of new property, and not wait for the possible customer to come to the showrooms.

Mr. F. LODGE (Wakefield) said that the importance of the position of the gas salesman had only come to be recognized in recent years. He suggested that the increased business was due in large measure to the opening of showrooms. Gas appliances to-day were very efficient; and if people would come to the showrooms they could be shown something which would interest them. If they would not come to the showrooms, then the salesmen must go to the people. This was being done more and more every day. Mr. Lodge suggested that it was a great advantage to have things so arranged that at the place where people paid their gas accounts there should be facilities for them to see gas appliances and make inquiries. Everybody in the gas department was a potential salesman, and he thought the accounts department should foster sales. Up-to-date maintenance schemes and appliances, and steady education of consumers to keep their appliances clean, would retain a great deal of the gas lighting load.

Mr. L. DENHAM (Halifax) remarked that an important point mentioned by Mr. Mottram was that of gaining and keeping the confidence of the consumer. It was a point which could not be stressed too strongly. Another important matter was that of comparison by salesmen of electricity and gas. He did not suggest that all mention of electricity should be prohibited, but he saw no reason why gas salesmen should be constantly advertising electricity and reminding people of electricity by talking of it in comparison with gas. When selling gas appliances, they should talk gas appliances.

Mr. E. BAILEY (Cleckheaton) pointed to the necessity for having intelligent and capable gasfitters. He was strongly in favour of an educational scheme for fitters in each gas undertaking. Men who were sent into the consumers' houses to do work must be a credit to the undertaking. Supply pipes, &c., should be as neat as possible. Gas departments did not always allow sufficient time for this. It paid to give tuition to fitters, even if the department employed only half-a-dozen or so. All appliances should be inspected (say) twice or three times a year, by someone connected with the gas undertaking.

Mr. J. D. LUPTON (Otley) thought Mr. Mottram was to be congratulated on putting forward very encouraging figures as to the comparative costs of gas and electricity. They were figures which ought to be remembered.

Mr. D. PARSON (Huddersfield) said it might truly be suggested that up to some ten or fifteen years ago the majority of gas engineers had a general impression that all they had to do was to produce cheap gas. Fortunately the bulk of people in the industry to-day realized that something more was necessary in the way of salesmanship. There was still a need for more attention to the installation of the best appliances. The salesman should lose a sale rather than let his department in for something which could not be satisfactory, and which would in all probability eventually result in the loss of a consumer.

Mr. E. STEMBRIDGE (York) said that the salesman might claim much for his apparatus; but if it was not well fitted, it would not give satisfactory service. Periodical inspection was excellent; but in many cases it was not practicable, and the most important thing was that the apparatus should be well fitted.

Mr. A. B. HORSFIELD (Leeds) mentioned that in Leeds they had a scheme under which all fitters attended a course of demonstration and training under the inspectors. The electricity people seemed to do well by their specially favourable system of charging, on a basis of rateable value, for domestic users. It was a method which made electricity compare fairly favourably with gas; and he thought it might be well if gas charges could be put on a similar basis, especially for cooking.

Mr. J. W. CARLTON (Shipley), speaking of obtaining the confidence of the consumer, said that the salesman should not be afraid, if necessary, to tell a customer candidly what an appliance could not do. The fitting should be such that it was a standing advertisement.

Mr. E. ADAMSON (York) agreed that it did good to get to know of complaints. At York they had a staff of men looking for complaints, and they were constantly in touch with the consumers. In regard to fitters, every undertaking could eradicate poor fitters by the simple expedient of training their own apprentices. This was what they did at York. They paid apprentices a decent wage, in order to attract a good class of youth into the industry. Their chief inspector gave weekly classes in theory and practice. The gas salesman might be born or he might be made; but he must be educated, and he must be an opportunist. One of the greatest essentials in the effort to gain public confidence was a consistent quality of gas.

Mr. H. RHODES (Bradford) hardly understood how the salesman could, as Mr. Denham had suggested, avoid mentioning electricity, having in mind the fact that the public would constantly be talking about it to the salesman. The rateable value basis of charging for domestic electricity was in operation in Bradford; but there it did not come anywhere near equalling the low price of gas for cooking, though for lighting in some instances it might run it fairly close. He thought it was only in houses where a great amount of electricity was used for lighting and heating that the cost per unit was brought down to something like the level of gas lighting. In general, with gas at 3s. 9d. per 1000 c.ft., it was cheaper, light for light, than electricity at 3d. per unit. For heating, cooking, &c., gas men had nothing to fear. Many people, of course, went in for electricity merely because it was so easy to switch on and off; and he thought gas departments ought to push the gas switch. They should emphasize the ventilation value of gas lighting. In a good many chapels which he knew in Bradford gas lighting was retained because of the ventilating value.

Mr. H. ROBINSON (Ossett) spoke as a meter inspector. It was the meter inspectors who got into the consumer's houses. They were on the spot; and if they could not effect a big sale themselves, they were in a position to introduce the consumer to the sales department and the showroom. He believed that in many cases they were in a position to arrange a definite sale on their own.

Miss ILLINGWORTH (Ossett) said that in Ossett they were developing the sales side very materially, and were doing a lot more business than formerly. They were developing very successfully the hire-purchase system, especially in cookers. It was largely a working-class district, and both in cookers and gas fires this method of sale was very advantageous.

Mr. R. FAWCETT (Ossett) agreed with Mr. Robinson that the meter inspector could be a useful salesman, because he was so closely in touch with the public. He usually heard of the complaints, and could draw attention to better appliances. If they would take notes of complaints and remarks by consumers, the meter inspectors could do a great deal of good to the industry. He thought the part of the meter man in selling was a subject on which a valuable paper might be given to the Circle.

Mr. H. WILDE, Hon. Secretary (Bradford), endorsed what had been said as to the importance of selling the right article for the right place. Mr. Mottram had touched a little on the public health aspect of gas versus electricity. The gas industry could claim that it did much for public health. Many public officials did not realize the big weight of expert opinion of medical men, professors, sanitary authorities, and others as to what an aid gas could be, not only in eliminating the smoke evil, but also as a ventilating agent. Experts had proved conclusively that a room lighted by gas was much healthier than one lighted by electricity. Mr. Mottram had spoken of general co-operation and increasing business. Undoubtedly the best way to increase business was to get the co-operation of everybody who could influence the sale of gas and gas appliances in any way—builders, architects, &c., and, not least, all branches of employees in the industry itself. Mr. Wilde fully agreed that the outside man could be a great influence.

Mr. C. E. GARSIDE (Otley) said that in many instances the industry was apt to pay too little attention to the lighting business.

Mr. ROBINSON (Ossett) suggested that [illegible] would pay gas undertakings to sell gas [illegible] cheaper prices for gas engines.

Mr. PARSON remarked that the privat[illegible] plumber often did a great deal of shoddy work. He knew of a little chapel, for instance, wher[illegible] to lights and a water boiler were all fitted b[illegible] a plumber to a single ½-in. pipe.

Mr. WATSON mentioned that little had bee[illegible] said in the discussion about that important bu[illegible] silent salesman the attractive showroom. H[illegible] suggested that at the earliest opportunity [illegible] would be well for the Ossett Gas Departmen[illegible] to move its showrooms from the present posi[illegible] tion to a better one.

Mr. BROADHEAD congratulated the member[illegible] on their spirited and valuable discussion an[illegible] on the serious interest they obviously took i[illegible] their work in the industry.

The CHAIRMAN said Mr. Mottram's pape[illegible] had given rise to one of the best discussion[illegible] the Circle had ever had. Mr. Mottram's re[illegible] marks had shown the deep interest which he[illegible] as an engineer, took in the advancement o[illegible] salesmanship. If they could get to the tim[illegible] when every gas engineer would stand up an[illegible] give the correct status to salesmen, as Mr[illegible] Mottram had done, then the millennium woul[illegible] have arrived for them. Mr. Mottram had bee[illegible] at pains to show how wide and deep the quali[illegible] fications of the salesman could go. He ha[illegible] been impressed by Mr. Mottram's suggestio[illegible] as to taking round a lorry, and showing ap[illegible] pliances to consumers who would not or coul[illegible] not go to the showrooms. It was a new ide[illegible] and was probably capable of important develop[illegible] ment. He was glad some of the meter inspec[illegible] tors had spoken of the important service the[illegible] could render in preparing the way for sales[illegible] He wondered whether the industry used a[illegible] much as it might do the great weapon of wid[illegible] publicity for gas in tackling the great smok[illegible] problem. Many of them were in a position t[illegible] dwell on this subject not only in the showroom[illegible] but at lectures and discussions at gatherings en[illegible] tirely outside the industry. Some of them di[illegible] some platform work in connection wit[illegible] churches, Sunday schools, and various socie[illegible] ties; and he thought they had in their hands[illegible] a valuable means of publicity for gas as a[illegible] eliminator of smoke.

Mr. MOTTRAM, replying to the various[illegible] points raised in the discussion, said he en[illegible] tirely agreed that it was good to hear com[illegible] plaints. It was important that people who ha[illegible] anything wrong should let the gas undertaking[illegible] know of it. It was bad to have people saying[illegible] nothing to the undertaking, but doing a lot o[illegible] grumbling among their friends. There wa[illegible] certainly a lot of poor appliances which ought[illegible] to be smashed-up, especially the kind of good[illegible] sold on Saturday night market stalls. He[illegible] agreed as to the importance of getting into[illegible] early touch with people concerned in new[illegible] buildings. The industry did a great deal in[illegible] that direction already. He agreed with Mr[illegible] Watson's criticism of the showroom at Ossett[illegible] In fact, when he first came to Ossett he had[illegible] no idea the showroom was in such a situation[illegible] and he hoped it would not be long before they[illegible] could get a good premises in a main shopping[illegible] street. He agreed also that it was desirable[illegible] to have appliances on view at the place where[illegible] people came to pay their accounts. As to Mr[illegible] Denham's observations on salesmen speaking[illegible] of electricity, he was afraid they could not help[illegible] but attack the electricity claims sometimes, in[illegible] view of the strange things the electric people[illegible] claimed. It was essential that the public[illegible] should be told occasionally that not everything[illegible] they heard about electricity was strictly cor[illegible] rect. He had been very much impressed by[illegible] Mr. Bailey's remarks on fitters, and agreed[illegible] with his suggestion as to training, though he[illegible] fancied he must have had in mind a good deal[illegible] of the work of private plumbers. He entirely[illegible] agreed that appliances should be inspected[illegible] periodically, and kept in proper order. He[illegible] agreed also with Mr. Parson in the suggestion[illegible] that the salesman should refuse to sell what[illegible] was obviously the wrong appliance. He fully[illegible] agreed with Mr. Horsfield as to classes for[illegible] fitters and the training of apprentices, but of[illegible] course a big undertaking like Leeds could do[illegible] some things which were hardly practicable to[illegible] the same extent in smaller undertakings. The[illegible] men at Leeds, who had such splendid opportunities to learn their job, would gradually[illegible] spread about the country, and would do a[illegible] great deal of good for the industry as a whole[illegible] As to the methods of charging for electricity[illegible] he fancied gas men would have some bad[illegible] headaches if they tried to work on some of[illegible] them. As a matter of fact, they were in many[illegible] cases most unfair to small consumers, who[illegible] were having to pay for the benefit of cheaper

terms for large consumers. He thought that very few electricity users really knew what they were having to pay. In answer to the request for further information as to waste-heat boilers, he would mention that Messrs. Wilsons & Mathiesons had had a great deal to do with designing a very good waste-heat boiler which was on the market. In his remarks in the paper, he had the boiler of Prof. Bone in mind; and he was sure there was a great future for this when it became more fully developed. He was delighted to hear his own meter inspectors speak in the discussion. They could do a great deal, but a point to be gone into thoroughly was the amount of time the inspector could be allowed to spend in booking orders, as compared with the time he must spend on his primary duties. In the main, one found by experience that people wanted the best article, and would pay the price for it. This was satisfactory from every point of view, because it meant that the public became pleased with gas service generally.

Mr. F. Lodge (Wakefield) proposed a vote of thanks to Mr. Mottram for his paper, and to the members of the Gas Committee for their encouraging presence throughout the meeting.

Mr. A. Plews (Bradford) seconded the vote; and

Mr. Mottram responded.

It was announced that the next meeting would be at Elland on May 13, and that in June there would be a visit, jointly with the Manchester District Circle, to the Leeds Works of Messrs. Wilsons & Mathiesons, Ltd.

Lancashire District—Manchester Section.

A meeting of the Circle was held on Wednesday, March 25th, in the Houldsworth Hall, Manchester—Mr. J. H. Sillitoe, Chairman, presiding.

An address was given by Mr. Hamilton Davis, B.Sc., of Leeds, on

GAS v. ELECTRICITY.

[Summary.]

It was pointed out that, in this country, electric current, in the vast majority of cases, is generated by the combustion of raw coal under boilers, and that in consequence a certain degree of atmospheric pollution results and the potential valuable bye-products are destroyed. The average efficiency—allowing for transmission loss—of the process was stated to be between 7 and 8 p.ct. The average efficiency of gas production is between 50 and 60 p.ct., and the efficiency of carbonization from 70 to 80 p.ct. The importance of a knowledge of the thermal value of an electrical unit—namely, 3414 B.Th.U.—was emphasized.

Gas and electric fires were next considered in some detail. It was pointed out that, though the latter depend chiefly for their heating effect on the emission of radiant energy, they are incapable of supplying the motive force necessary for the adequate ventilation of an occupied apartment. The number of requisite air changes per hour was mentioned; and it was stated that the ventilating type of gas fire fulfilled these requirements, and at the same time supplied ample warmth, chiefly in the form of radiant heat. The question of initial cost was considered; and it was shown that the advantage to the consumer in this respect lay very decidedly with the gas appliance. Running costs, on the basis of 1d. per unit of electricity and 9d. per therm of gas, for gas and electric fires were compared; and it was demonstrated that, taking competing fires of equal heating capacity, the cost of current was between two and two-and-a-half times that of the gas consumed.

The heating elements of the electric fires are fragile in comparison with the parts of the gas fire. When installed, the latter requires but little attention, and any necessary adjustments can be made *in situ* without any disturbance to the consumer.

Gas and electric cookers were next compared; and it was stated that the highest-grade gas cooker was a far less costly appliance than an electric cooker of distinctly smaller capacity. In addition, the construction of the latter necessitated a degree of delicacy and complexity not found in the gas appliance. Before results of comparative tests were given, it was mentioned that consumptions of electrical energy had in all cases been measured by a specially tested watt-meter.

The construction of a typical electric hotplate was described; and it was emphasized that, in carrying-out water-boiling tests, the condition of the base of the kettle was all important. To obtain the best results with the electric hotplate, the base of the kettle used should be dull black, in order that the radiant energy from the heated resistance elements should be freely absorbed.

All data given were obtained using kettles with dull black bases. The cost of electricity for heating water to boiling-point was found to be between four and five times the figure obtained when using gas, and the time taken was 60 p.ct. longer with electricity. The latter consideration is of importance to the housewife or cook. The two types of drill were examined; and careful comparative experiments failed to show that a smaller weight loss of meat occurred in the case of the electric grill. The reverse effect was found, due to longer time required, on account of the lower temperature of the electric, as compared with the gas, grill.

Passing on to a consideration of the electric oven, it was mentioned that among the chief claims advanced on its behalf were the following:

1. That by employing the same oven and switch position, the same oven temperatures were invariably obtainable.
2. That the electric oven required no watching.
3. That weight loss—especially in the case of joints—during cooking was reduced.

Dealing with the first of these, it was pointed out that this apparent truism, when translated into a claim for the electric oven as a cooking appliance, depends on the assumption that the various switch positions provided correspond with the diverse cooking temperatures required in practice. This is not always found to be the case. During the cooking of a joint, for example, it is necessary to alter frequently the switch position, if a steady rate of cooking is to be maintained. It appears doubtful whether the electric oven is sufficiently flexible. The gas oven, on the other hand, provides an almost infinite range of cooking temperatures.

With regard to the second claim, extracts from a card of instructions actually supplied with an electric cooker were quoted, in which manipulation of the oven-switch, and the necessity for changing the position of foodstuffs during the cooking process were definitely specified as necessary. On these grounds, it was felt that this claim could not be maintained, and the electric oven compared unfavourably with the gas oven fitted with an automatic temperature-controlling device. This latter eliminated all attention as regards the regulation of oven heat.

The third claim was critically examined and shown to be highly improbable on common-sense grounds. When submitted to tests for two typical cooking processes—namely the baking of bread and the cooking of meat—it was found to be without foundation. For the same degree of cooking, the same weight loss was found in the case of the gas and electric ovens compared. It was strongly emphasized that, to ensure an accurate comparison, the same materials should be taken, and a similar procedure adopted for both ovens. The cost of cooking in the electric oven, on the basis of the charges for current and gas already mentioned, proved to be approximately three times the figure obtained when using gas.

Discussion.

The Chairman said his experience was in agreement with that of the lecturer.

Mr. Robinson (Altrincham) remarked that electric cookers had been installed in his district, but had yielded results inferior to those of gas cookers.

Mr. Barker (Manchester) thought that one advantage of electric cookers was that no products of combustion were formed.

Mr. Davis said that it must be borne in mind that gas cookers were for the most part installed in houses which had been designed for cookers using coal as a heating agent.

Social Evening.

Members of the Circle assembled at the Mitre Hotel, Manchester, on Wednesday, April 8, for a social evening. Mr. J. H. Sillitoe presided. After supper there was a musical programme.

In the course of the evening a cheque was presented to Mr. A. Gilson, the Hon. Secretary, in recognition of his zeal and efficiency in the discharge of his duties.

Mr. Gilson gratefully acknowledged the gift, and paid tribute to the Chairman and Committee for the help they had always given him.

The musical entertainment was furnished by the following: Messrs. J. Fitton (Oldham), R. H. Garlick (Salford), A. H. Williams (Chester), P. H. Christian (Southport), J. F. Proctor (Manchester), and Brown.

The health of the Chairman, proposed by Mr. J. B. Stewart (Rochdale), was heartily received, and was acknowledged by Mr. Sillitoe, who said that what he had done had been a real pleasure.

APRIL MEETING.

A Meeting of the Circle was held at Liverpool on Wednesday, April 22. The first item on the programme was a visit to the Gas Company's Showrooms in Duke Street. Mr. W. B. Payne, Distribution Superintendent, welcomed the visitors, and he and his assistants conducted them over the showrooms, where there was a fine display of appliances.

The main offices are very imposing, with their Corinthian columns, beautifully-tiled floor, and ornamental roof and central dome. The hall and the floor space of the main office are used for the display of hire goods; and switches are fitted for demonstration purposes. One room is devoted to gas-heated hot water apparatus and appliances used for industrial work. The main showroom contains a good selection of lighting, cooking, and heating apparatus. The meter and general repair shops are also well equipped.

As illustrating the progressive spirit of the Liverpool Gas Company, it may be mentioned that they have taken additional premises in Lord Street, Liverpool, for the display of their goods. Lord Street is in the shopping centre of the city.

A visit was next paid to the showrooms, in Bold Street, of Messrs. John Wright

& Co. Here the visitors were welcomed by Mr. Thompson (the Chief Salesman) and other representatives of the firm. Attention was directed to the "New World" gas cooker.

Later the members of the Circle assembled in the Engineering Society's Rooms, Liverpool, under the presidency of Mr. J. H. Sillitoe, of Manchester. Mr. W. B. Payne opened a discussion on "Gas Lighting," and Mr. C. Dickens (Manchester) spoke on "The Outdoor Salesman." Interesting discussions followed. Mr. Payne's paper was illustrated by a series of lantern slides.

Southern District—Kent Area.

A Meeting of the Circle was held on March 11, at the Offices of the Deal and Walmer Gas Company—Mr. P. PICKERING presiding.

Mr. J. F. TYNDALL (Manager of the Company) extended a hearty welcome to the members of the circle.

Mr. E. H. DUNN (Deal and Walmer Gas Company) read a paper on

GAS SALES—A FEW SELLING POINTS.

To increase gas sales, we must sell reliable gas appliances and give satisfactory service. In our Company prior to 1919 we did practically no fitting work. Fittings sales and chargeable fitting work up to 1919 were *nil;* in the year ended June, 1924, they amounted to nearly £3000. We feel confident that we shall exceed this figure during the current year.

FREE INSTALLATIONS.

We have a system in force called the "slot installation." Under this we lay a gas supply to a house, fix a meter, three lights, and a ring—or, alternatively, two lights and a cooker—free of initial cost. The charge for gas is the ordinary prevailing price—*plus* 3d. per therm. The maximum length of pipe run free is 50 ft. The hire of the gas cooker is paid separately—so much per quarter, according to the size.

PUBLICITY.

The following are a few of the ways in which we endeavour to keep ourselves to the fore:

Fortnightly advertisement in the local paper, on lighting, heating, or cooking.

One page in the entertainments programme every season. (There are from 30,000 to 35,000 copies printed.)

One page in the Lloyds "Memorial Homes" Booklet.

An advertisement on the back of our residual and fittings billheads.

When possible we make use of "B.C.G.A." literature, such as "A Thousand-and-One Uses for Gas," which we distribute locally.

We circularize hotels and boarding-houses with pamphlets advertising gas-fire meters, &c., for sale outright only.

The local schoolmasters and private schools are supplied with "Gas Notes for Teachers."

At Christmas time fifty packs of playing cards and three dozen calendars are distributed with gas advertisements on them.

I should like to draw your attention to one point which I feel comes within the salesman's sphere—that is, the selling of coke-burning apparatus. In cases where a consumer, on account perhaps of fuel cost, refuses to have (say) a gas circulator, the fixing of a coke boiler should be advocated. The selling of coke helps to reduce the price of gas.

We have a burner maintenance scheme, which we hope will be a great success in the near future.

It is desirable to have definite periodical entry into a house, to regulate the burners. Often a customer will not trouble about his fittings when they require attention, but blames the gas company for any defect. An inclusive price is charged for material and labour. We also put a small advertisement on the back of the maintenance form.

We employ the part services of a lady demonstrator. This lady circularized the whole district with a letter and a reply postcard asking householders if they had any difficulties with their cooking apparatus. This constituted an excellent method of ensuring satisfaction and introducing new customers.

To condense the foregoing:

(1) An undertaking must supply the very best material and give the best service.

(2) The showroom must be properly equipped.

(3) Advertising must in no way be stinted.

(4) There must be a full and complete co-operation between the staffs, and salesmen should be enthusiastic, energetic, and capable.

The CHAIRMAN voiced the thanks of the meeting to Mr. Dunn for his paper. He also thanked Mr. Tyndall for the welcome given to the Circle, and the Directors of the Deal and Walmer Gas Company for their hospitality.

A New Point of View in Gas Cooking.

(See Illustration below.)

The complete departure from the design of all existing models of their gas cookers evidenced in Wright's new "Eye-Level" cooker requires but a glance for its full justification. To have under the eye, on one level, all the operations of cooking the various parts of a dinner, makes this task very much simpler and quicker. The stooping, the lifting of heavy joints, &c., and the necessity for standing in front of a heated oven to manipulate pans on the hotplates are entirely obviated. With the "Eye-Level," cooking becom a genuine pleasure, to be enjoyed witho any of the fatigue or irritation which we previously inseparable from the kitche range. From the housewife's point view this is ideal; and it is not to b wondered at that the demand for this typ of cooker is on the increase.

Wright's "Eye-Level" cookers hav high-efficiency hotplates of the open typ (the half-solid top is supplied at a sma extra charge) giving high efficiency an real economy. The addition of the warm ing chamber in these models is an impor tant feature. A small independent burne keeps this at a suitable temperature an uses little gas. There is no doubt tha where the extra kitchen space is avail able, the "Eye-Level" cooker will be come popular. This type is made in si sizes, the width of No. 1464 (the smalles size single oven type) being 3 ft. 6 in. while the maximum over-all width of th largest size (double oven) is increased t 5 ft. 11 in., thus affording a wide choice Where it is possible to take out the coal fired range and substitute the "Eye Level" in the recess, this, when neatly installed and suitably tiled, gives the kitchen a smart appearance.

Attractive literature illustrating and describing the cooker will be forwarded on application to Department "A," Messrs. John Wright & Co., Essex Works, Aston Birmingham.

Any Buyers?

In the "For Sale" column of the "Chichester Observer" for April 22, the following advertisement appeared:

FOR SALE.—Small ELECTRIC COOKING STOVE, £1 10s.; or would exchange for small Gas Stove.—ROGERS, George Street, CHICHESTER.

We shall not make a charge for the additional publicity given to the advertisement.

The "Eye-Level" Cooker.

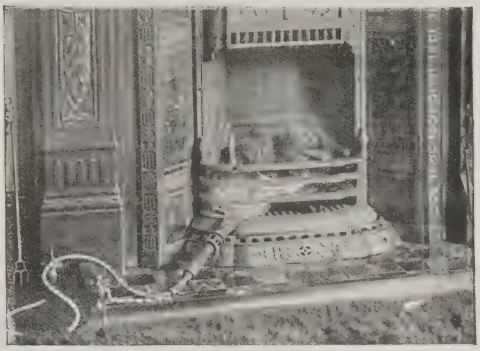
The "Bland" Poker Burner.

Last month, in a paper which he read before the Southern District (London Area) Gas Salesmen's Circle, Mr. A. Tennant, of the Croydon Gas Company, drew attention to the poker burner, which, he said, fulfilled a very useful purpose. In the discussion which followed, Mr. W. J. Sandeman, also of the Croydon Company, referred to the poker burner as an excellent appliance; it gave an opportunity for piping houses throughout. [An account of this meeting was published in the "Salesman" for March 25, p. 64.]

In view of this, salesmen will be interested in the accompanying illustrations of the "Bland" poker burner, which eliminates the time and expense of laying paper and wood, and enables one to kindle a fire almost instantly by simply placing the lighted "poker" beneath the solid fuel. Dying embers can be immediately enlivened.

The burner is connected to a gas tap (fixed at the side of the grate) by a strong flexible metallic tube, and can be inserted into, and withdrawn from, the grate at will.

The burner is manufactured by the Bland Light Syndicate, Ltd., No. 29, Little Trinity Lane, London, E.C. 4.



"Bland" Poker Burner in Use.

View of Burner.

Southern District—Sub-Section "B."

The Monthly Meeting of the Circle was held at Portsmouth on Thursday, March 12—Mr. J. Lucas (Chairman) presiding.

CINEMA ADVERTISING WITH ILLUSTRATIONS BY SLIDES.

By M. Tyler, of Chichester.

Advertising is a real handmaid to salesmanship; and in its several forms a most useful one. I would mention two such forms:

General.—Such as advertisements in the public Press, and the modern artistic posters.

Personal.—The printed message sent by post, the poster stamp, &c.

Our subject to-day has about it an element of both; being general in its appeal at a public assembly, and personal in that the pictorial message has its own appeal for each individual present. This form of advertising is not solitary in its appeal—by which I mean it can be run in conjunction with either of the foregoing methods of advertising, it can be made to supplement general and personal advertising, or it can be used in connection with a speciality display in the showroom. The various methods employed in salesmanship and advertising are interdependent; and all must be consistent if real success be desired.

We are very much in the position of the old-time trader taking his goods to market. Our market to-day, however, is any place where we can influence public opinion; and the cinema, if properly used, can, I think, be made a very effective medium to this end. We say that personality means much in the make-up of a salesman. Well, even in the method of securing business by cinema advertising, personality has still to be expressed. In this case our picture and the message accompanying it should suggest talent and the live mind behind the production. Then we shall have maintained personality. We must not be content with an average second-rate slide. It is agreed that a salesman must be versatile. This, in principle, we obtain by arranging our slides to influence as large a variety of minds as possible. A point to remember—and a very important one, too—is that the impression we seek to make is confined to a matter of moments only.

It is in a sense a branch of suggestive salesmanship, for if by knowing our goods we can, by our initiative in sensing customers' needs, strike the popular imagination, and provoke it to think over the subject of the picture screened, we shall have done well in this new form of business getting. Above all things, we must remember that our object is to create interest; and this by tact, good humour, and sincerity, remembering that it is not only what we show, but, what is equally important, how we show it. A shoddy advertisement surely dubs the speciality accordingly, and lets the goods down.

The question of cost must be taken into account in any proposition, but in my opinion this is negligible in relation to the many silent messages sent home. I am of opinion that the cumulative effect in helping to mould the community sense in favour of gas is worth more than the price paid. In our case, it is £3 10s. for six months, which, at three showings a day, represents 468 projections—or just under 2d. each, *plus* the actual cost of slides, which has averaged 3s. 6d. each.

Another matter we should do well to bear in mind, for it is regarded almost as a point of honour in well-conducted businesses of the country to-day, is never to decry a competitor's goods and service. We in the gas industry are one of several public utility services having a thoroughly good commodity, and it is up to us to bring it before the public solely on its merits. We have a good case; let us then be enthusiastic over it, and our enthusiasm must overflow into our advertisements. Only business secured on its merits can be maintained in face of keen competition.

Mr. Tyler then exhibited and explained a series of fifteen slides which were used for cinema advertising in his district.

Discussion.

The Chairman mentioned that the short paper was a new departure for the Circle, and congratulated Mr. Tyler on both paper and slides, which he considered very apt for the purpose in view. He suggested that many companies should follow the example.

Mr. A. J. Garward (Portsmouth) congratulated Mr. Tyler and the Chichester Gas Company for their consistency in keeping gas before the public. It was very difficult to trace results from this method, but, like all good advertisements, it must bring its reward. His Company had not adopted this system; but a series of slides shown on theatre frames had been tried; and this cost 4s. per house per week.

Mr. Davis (Gosport) said that, while his Company had not adopted this method, they ran an advertisement on cinema programmes and screens.

Mr. Tyler replied to questions raised, and said that Chichester regarded it as a point of honour not to decry another man's goods.

ONE WAY OF DEALING WITH A ROOM WITHOUT A FLUE.

By J. Monk, of Winchester.

Often an inquiry is received for someone to call with regard to a gas fire required for a spare room. On calling, the Company's representative is shown the room; and he at once notices that there is no flue. He points this fact out to the consumer, and is told "I want one of those fires to stand in the middle of the room, as exhibited in so-and-so's shop," or "as advertised in such-and-such a paper." I know all of you here, or most of you, have met this sort of thing on your districts; and I will briefly tell you how I have successfully dealt with this question on my district.

I have explained to the consumer why I would not fix the fire asked for, and also that I could not lay on a supply of gas for the consumer himself to fix the fire. I have then asked for an open order to supply and fix a gas fire, and guaranteed satisfaction, ascertaining the most suitable corner of the room. In one corner I fit a stone slab, as used under cookers, and stand the fire on the slab across the corner. To the fire I fit a Urastone flue elbow, to take the flue nozzle of the fire, and continue with Urastone flue piping up the inside of the room, then break through the wall to the outside as near the ceiling as possible, and then carry on outside as with a geyser flue, fitting a cone top or suitable cowl as required.

It is important that all the flue should be of Urastone, from the points of view of utility, heat retention, and lack of condensation. Urastone can be painted to match any interior decoration. On all

these points it leaves sheet-iron flue piping out of the question. To make a good finish to the job, the corner could be boxed-in with plain Uralite sheeting above a mantel-board, and tile-pattern Uralite behind the fire below the mantel-board. In other words, we make a fireplace.

If it is required that the fire shall be fixed against the wall, instead of across the corner, a rectangular-pattern flue can be used. Where the room is on the ground floor, the flue can be carried through the room above before breaking through to the outside, as I believe in keeping as much flue as possible inside, for retaining the heat and assisting the chimney draught.

I have fitted several fires in this way on my district, and have yet to receive a complaint. It is advisable to obtain an open order for this work, as local and atmospheric conditions may require experiments with the flue work outside the building.

Discussion.

Mr. ELLIS (Chichester) raised the question of proper ventilation, and explained the method adopted at Chichester. He said they found that, as the flue pipe warmed, the increased velocity of flue gas put matters right.

Mr. MATTHEWS (Portsmouth) asked what the cost of fixing gas fires as explained amounted to. First cost was often a deciding factor in these cases.

Mr. MONK briefly responded to questions, and gave the cost of fixing.

The members were afterwards entertained to tea by the Directors of the Portsea Island Gas Light Company.

SITUATIONS VACANT.

9d. per Line—Minimum, 4s. 6d.

COUNTY BOROUGH OF BURNLEY.
(GAS DEPARTMENT.)

APPLICATIONS are invited for the Position of SHOWROOM MANAGER and INTERNAL FITTINGS INSPECTOR in the above-mentioned Department.

The commencing Salary will be £307 per Annum, and will be governed by the Corporation's Grading Scheme, Grade D.1. which has at the present time a maximum of £351. These amounts include Bonus, which Bonus is liable to fluctuation in accordance with the cost-of-living figure.

Applicants must have had previous Experience in this class of work.

Form of Application, with Conditions of Appointment, must be obtained from the Gas Engineer, Gas-Works, Burnley.

Applications must reach the Gas Engineer, Burnley, on or before Wednesday, the 13th of May, endorsed "Gas Showroom Manager."

COLIN CAMPBELL,
Town Clerk.

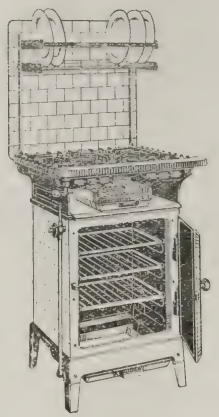
Town Hall, Burnley,
April 15, 1925.

MAIN
MAKE GAS SALES GROW

COOKING AND HEATING SPECIALITIES
OF EVERY DESCRIPTION.

R. & A. MAIN, LTD.,
Gothic Works,
LONDON and FALKIRK.
London Showrooms: 38, Grosvenor Gardens, S.W.1. Glasgow Office and Showrooms: 89, Gordon St.
Contractors to the Admiralty and War Office.

"Supastone"
THREE-PLY GLASS
Modern Lighting Glassware.
The WHOLESALE FITTINGS CO., Ltd.,
23, 25 & 27, Commercial Street, London, E.1.
See Advert. p. 269 of "JOURNAL," April 22.



Gas Salesmen are specially invited to send for the booklet describing the Radiation "NewWorld" Cooker.

Its automatic oven-heat control device is the most highly praised development in the Gas Industry since the Incandescent Lighting Mantle was produced.

ARDEN HILL & CO., Birmingham and London.

THE DAVIS GAS STOVE CO., Ltd., London and Luton.

FLETCHER, RUSSELL & CO., Ltd., Warrington and London.

THE RICHMOND GAS STOVE & METER CO., Ltd., Warrington and London.

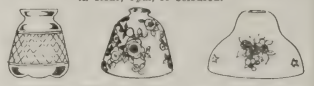
WILSONS & MATHIESONS, Ltd., Leeds and London.

JOHN WRIGHT & CO., Birmingham and London.

RADIATION LTD.,
PROPRIETORS

CLARK'S
"SEVERN" COOKER.
A Small Cooker and Griller suitable for Consumers living in FLATS OR SMALL HOUSES.
CLARK'S SYPHON STOVE CO., LTD.,
164 172, Queen Victoria St., London, E.C. 4.

Ackroyd & Best Ltd., Morley, Nr. Leeds.
Actual Makers of
GLASSWARE for All Lighting Purposes,
in Clear, Opal, or Coloured.



Falk, Stadelmann, & Co Ltd.
VERITAS LIGHT WORKS
LONDON GLASGOW MANCHESTER BIRMINGHAM
Everything for Gas Lighting, Heating, and Cooking.
See Advert. on p. 293 of "JOURNAL."

The Bland Light Syndicate, Ltd.,
29, LITTLE TRINITY LANE, E.C. 4.
Specialists in Gas Lighting.

PARKINSON'S
"STANDARDISATION"
Methods of Construction
REDUCE MAINTENANCE COSTS
— OF —
GAS COOKERS :: GAS FIRES
— AND —
HOT-WATER APPLIANCES.
The Parkinson Stove Co., Ltd.,
LONDON, BIRMINGHAM & GLASGOW.
See Advertisement on p. III. centre of "JOURNAL."

THE
WELSBACH LIGHT CO., Ltd.
The oldest firm in the
INCANDESCENT GAS TRADE
and ALL BRITISH.

Adjustable Art-Metal Surrounds.
Mantelpieces in Art-Metal.
Canopy Surrounds, Hearths, etc., etc.
F. TURNER
61,62 & 63, Summer Hill Street,
BIRMINGHAM.

BURNERS (1921) LTD.,
Manufacturers of
"EFFICIENT"
BURNERS and LAMPS
STOKE PRIOR WORKS,
BROMSGROVE.
PHONE: BROMSGROVE 118.
REG. TRADE MARK.

Binders for "The Gas Salesman."
SPRING BACK—CLOTH,
GILT LETTERED.
Price 3s. 9d. Carriage free.

"Facts and Figures for Salesmen."
(Reprint, in 8vo pamphlet form, of articles appearing in "THE GAS SALESMAN.")
Prices, post free, 100 copies, £1; 50, 10s. 6d.; 25, 5s. 6d. Single copies, 3d.
WALTER KING, LTD., "Gas Journal" Offices, 11, Bolt Court, Fleet Street, London, E.C. 4.

Printed (at the Chancery Lane Printing Works, Ltd.) for WALTER KING, LIMITED, No. 11, BOLT COURT, FLEET STREET, LONDON, E.C. 4.—Wednesday, April 29, 1925.

The Gas Salesman and Gas Service.

Vol. 4, No. 41.]

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APPOINTMENTS & PROMOTIONS.

Gas Salesmen, Showroom Attendants, and Manufacturers' Representatives are invited to send information as to promotion or changes in appointment for publication under this heading.

NOTICES.

Copies of this Supplement for Distribution among Members of the Gas Sales Staff, can be obtained at the office of the "Journal." Price per 100, 35s.; 50, 18s.; per doz. 4s. 6d.—plus postage; single copies, 5d. (stamps for single copies with order).

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The Editor reserves to himself the right to delete from, or modify any, communications submitted dealing with matters of a purely personal nature.

All communications should be addressed to

WALTER KING, Ltd.,
"Gas Salesman" Supplement,
11, Bolt Court, Fleet Street,
London, E.C. 4.

Telephone Number: CENTRAL 6055.
Telegrams: "GASKING, FLEET, LONDON."

EDITORIAL.

Wembley Reflections.

Where millions of people go expressly for sight-seeing, instruction by display and object-lesson, and for lighter pleasure, there gas should be. That is the deliberate opinion of the gas industry. It is at Wembley again this year—the possessor of more elbow-room. Thus the Gas Exhibit Committee have been able to offer the public a more varied range of interest than in 1924. Nothing is cramped; and there is ample room for inspection, and for soliciting information, by visitors. The advantage of this has been felt, particularly on days when the attendance is the largest; and attendance does vary considerably from day to day, even at an Exhibition having such world-wide attractions as that at Wembley—the days and hours commonly devoted to leisure naturally yielding the greatest number of visitors. Speaking generally of the Exhibition, it has in several ways been greatly popularized this year. As His Majesty the King stated at the reopening, it has been made "lighter and brighter," and, in accomplishing this, interest has not been sacrificed but has been popularly augmented. Gas salesmen—in fact, all men and women engaged in commercial exploitation and sales work—know the value of this; and therefore, successful as was the Gas Exhibit in its mission last year, there is every confidence that the one this year (especially if Old Sol is in genial mood) will exceed it in good work. The "lighter and brighter" ideal captured the Gas Exhibit Committee, particularly the Chairman of the Executive (Mr. F. W. Goodenough), his fellow-members, and active lieutenants; and they have brought it to bear upon their devisings for this year's display. Not that last year's exhibit lacked beauty and brightness; but, in our opinion, what was then done has been excelled this year. Gas salesmen throughout the country will want to judge, and will find opportunities for judging, for themselves. Their business is to get ideas from all sources; and the exhibit will be a large source of ideas for them. If we give of our own ideas, we never need be ashamed to use the ideas of others. In our industry, we have planted, cultivated, and enjoy the co-operative spirit; and it has become part of our common creed to give and to take in a common cause.

The Gas Exhibit is, of course, for creating impressions upon the public mind which will be of advantage to the industry, to the public themselves, and through them to the nation at large. Nevertheless, here we may look at it from the gas salesman's point of view. Gas salesmen have a good general idea of the magnitude of the industry, and of how it penetrates into the domestic, industrial, and trading life of the nation. Its services are manifold and indispensable. But after a studied inspection of the exhibit this year—not a mere casual run round it—we think every salesman will admit that it has taken him out of his own little world of activity, and brought him, admittedly in a small way, into contact with the work that is being done by the gas industry in the far parts of the earth—in other words, in other quarters of our great Empire. The scenes depicting the uses of gas in our principal Dominions should impress gas salesmen at home. They will be reminded that the work of their fellows in those distant places is of a more onerous character than it is in the homeland. They have not the advantages that we have at home. They have not a "B.C.G.A.," they have not at hand the same plentiful and helpful supply of current literature, they have not Salesmen's Circles for conferences, they have not the same immediate advantage of an extensive choice of types of gas-consuming apparatus that the large market offers in this country, there is not the same scope for business, and withal the price of gas is considerably higher than here. And yet those in charge of the sales of gas in those far-away places show good results from their labours. All honour to them! As salesmen at home think of their successes while viewing one of the features of the exhibit, they will also remember their disabilities, and thank their good fortune that their lot for increasing business is cast in more pleasant places.

Another feature that will strike the salesman is the demonstration of refinement that pervades the exhibit, and which acts as a framework to the vast amount of utility—domestic and industrial—which is on view. In describing a gas exhibit in these times, one has to keep well in mind the points at

which competitive attack is the strongest. The electrical people in their campaign suggest that gas is ill-adapted for lighting, heating, and cooking in the house of modern design. The exhibit proves the contrary in each respect. There is lighting for all purposes. The range of heating appliances shows adaptability for all types of houses and styles of appointment. Cooking is demonstrated in a properly equipped hall for all domestic circumstances as well as (in another part) for large catering establishments, and so is water heating. It is all very comprehensive from the domestic aspect; and it extends largely (by example) into industry and trade. There is no need in the "Gas Salesman" to enter into descriptive detail, in view of the full account given in the "Gas Journal" for the 13th inst. Speaking of catering, in that same issue will be found particulars and illustrations of the large gas equipments that have been adopted by the several eminent firms of caterers for feeding the multitude. It is fine testimony to the preference of experts. There is also mention of the extensive use that is being made of gas in the processes of the various exhibitors; as well as reference to the outdoor gas lighting in the Amusements Park. But this is a digression for convenience.

Another suggestion occurs, looking at the scope of the exhibit from the gas salesman's point of view. It is that those whose occupation is to develop the sales of gas and of appliances must not allow their title to limit them in putting in a good word for the secondary products of the concern they serve. They are "secondary" in name, but highly important to every gas undertaking. The price of gas is being raised in many places. An increase in price is not to the liking of the gas salesman; he prefers to see the price of his staple commodity on the decrease. Like good demonstration of the virtues of gas such as is seen at the Gas Exhibit, a low price makes easier the work of bringing about accretions of business. The main cause of the increase of gas prices just now is the reduced demand and values for secondary products. It is hoped this is only a temporary phase in the industry's conditions. But as the secondary products play such an important part in the price of gas, it is to the interest of the gas salesman, on every opportune occasion, to put in a good word for their use. It will be found that at the Gas Exhibit and elsewhere—ta for instance, at the sign of "The Jolly Jack Tar" not far away—the secondary products of coal carbonization fo gas supply are displayed. The objec is to bring to greater public attentio the bye-products, and to increase th demand for them. The larger and th more permanent the demand can b made, the better; for the supply is o the increase, and we want at any rat the one to balance the other at price which will enable the charge for gas t be kept as low as possible.

From all points of view, the Ga Exhibit is worthy of the industry We admire the vision it contains, an its comprehensiveness in detail and i presentment. It is all well done. Th more use gas undertakings make of i by engendering a desire to see it o the part of visitors to Wembley, th greater will be the success in it mission. Gas salesmen, whereve located, can easily, when in conversa tion with customers, put-in a word re garding the display. It will all help t advertise it.

Cookery Centre at Leamington Spa.

In order to facilitate the teaching of cookery to pupils in the elementary schools of the Borough of Leamington, a cookery centre has been opened recently. The appliances provided comprise a Flavel "1923 E30" cooker fitted with "efficiency" burners, plate-rack, enamelled stand, and hood to remove steam, &c., and a separate hotplate similar to that of the cooker. Hot water for washing-up and cleaning purposes is provided by one of Ewarts' "2D Lightning" geysers. The room is efficiently lighted by one 500 c.p. Sugg "Caterham" lamp.

View of the Equipment.

Single-Line Window Displays.—Writing in the "American Gas Journal," Mr. W. H. Matlack advises those responsible for window displays not to hesitate to use neat price tickets on the goods shown. Such tickets often neutralize the timidity which exists in a large number of window shoppers. Display creates a desire; and known prices often clinch the sale. Back up the window display with a good interior display. Psychologists say that the average person cannot attend to more than five units at a time. This, he says, seems more than reasonable, and is a sound justification for confining window displays to single lines, if results are to be obtained. Getting attention concentrated is the big idea. One is not apt to create a desire until this is done; and unless the desire is created, people will not be induced to pass into the premises. That is the end for which to work.

Notes from the "B.C.G.A." District Conferences.

Competition Points.

Several District Conferences of th British Commercial Gas Association hav recently been held; and many of the state ments made by the speakers at these con ferences show how rapidly the use of ga —both domestically and industrially—is in creasing.

Take the Leicester undertaking, fo example. Last year, Councillor Hilto mentioned at the Midlands Conference, th increase in the sale of gas amounted t 155 million c.ft. At present in Leiceste there are between 900 and 1000 gas engine at work; while out of nearly 68,000 con sumers for all purposes, 60,000 have ga cookers. During the past ten or twelv years, 12,000 gas fires have been fixe either on hire-purchase or simple-hir terms.

Atmospheric Pollution.

As Mr. F. W. Goodenough said, it is t gas and coke that the country can look fo its salvation from smoke. Electricity fo power—for mechanical power, for th term "power" has been used much to loosely by political writers and speakers— is, together with the gas engine, doin much to diminish the factory chimne nuisance; but as a fuel it has no future except for incidental use here and there. I cannot touch the great domestic heatin problem. Gas is the solution of the prob lem which appeals to the housewife, wit coke where cheap solid fuel is reall necessary. Apart from the question of th effect upon health and our national wealth there is the effect on the conditions o labour, both in the home and in industry which gas is able to bring about. The ga industry can honestly say that it has con tributed to the health and well-being o workers by helping employers to provid ideal conditions for their employees. W need to be continually informing the publi of what gas means to labour and th working people of this country.

It is the domestic chimney, multiplie by hundreds of thousands, which is th predominant factor in air pollution. Bu London is showing wonderful signs of im provement in this respect. In five yea

no less than one million gas fires were installed in London houses, which means that probably about one million tons less coal were consumed. Recently Dr. Owens (Superintendent to the Advisory Committee on Atmospheric Pollution) said in a lecture: "Thanks to the gradual substitution of gas fires and other smokeless appliances for the antiquated coal fire, the soot deposit in London last year was only 59 p.ct. of that in 1916.

Progress in Scotland.

From official returns, it is found that for the year 1912 the quantity of gas manufactured in Scotland was 17,301 million c.ft. During the succeeding period of twelve years ending with 1924, the quantity increased to 25,188 millions. The increase, is therefore, 45½ p.ct.; and this has undoubtedly been largely obtained as the result of extended use for domestic cooking and heating, and also for industrial purposes. From a calculation, the remarkable estimate is obtained that, to produce the gas required in 1924, actually less coal was used than in 1912. The figures are: Coal used for gas production in 1912, 1,730,000 tons; and in 1924 (with a 45½ p.ct. increase of gas), 1,679,000 tons.

Costs.

At the Greenock Conference Mr. George Keillor put forward the following comparison of cost for delivering equal amounts of useful heat for various purposes by gas and electricity. The data were obtained on the basis of gas of a calorific value of 410 B.Th.U. at 7d. per therm, and electricity at 1¾d. per unit.

Electric Radiator.—One pennyworth of electricity (crediting radiator with 100 p.ct. efficiency) will give out 2736 B.Th.U. of useful heat.

Gas Fire.—2736 B.Th.U. of useful heat (gas fire efficiency of 70 p.ct.) costs 0·28d.

Electric Geyser.—Five pennyworth of electricity (geyser efficiency 90 p.ct.) will give 15,390 B.Th.U. of useful heat.

Gas Geyser.—15,390 B.Th.U. of useful heat (geyser efficiency 80 p.ct.) costs 1·34d.

Electric Boiling Rings.—One pennyworth of electricity (boiling ring efficiency of 50 p.ct.) will give 1368 B.Th.U. of useful heat.

Gas Ring.—1368 B.Th.U. of useful heat (gas ring efficiency of 50 p.ct.) costs 0·192d.

The main facts emerging from the comparison are:

(1) Heating rooms by electricity requires the consumption of 4 times as much coal as the same service by gas.

(2) Geysers heated by electricity require the consumption of 5⅓ times as much coal as the same service by gas.

(3) Boiling water by electricity requires the consumption of 6½ times as much coal as the same service by gas.

(4) Heating ovens by electricity requires the consumption of 3 times as much coal as the same service by gas.

The output of gas in Greenock will this year exceed 600 million c.ft., compared with 418½ millions in 1913-14 (an increase of 43½ p.ct.

Speaking at the Chester Conference, Mr. Owen Evans said that the average efficiency of gas in actual use for the customary domestic duties is well over 50 p.ct.; and if all the coal at present consumed for domestic purposes was carbonized at the gas-works, no more coal would have to be used, and there would be over 20 million tons of coke to spare, which could be utilized with efficiency, in displacement of coal, for various industrial purposes. There would also be an enormous additional supply of the other bye-products. Or, alternatively, such is the flexibility of the gas-works method, the whole of the extra coke and tar produced could be gasified; and the coal used at the gas-works would be proportionately reduced. On the other hand, if the coal used for domestic purposes were substituted by electricity, the quantity of coal required would be increased threefold—*i.e.*, to the enormous quantity of 120 million tons per annum.

Gas and Electricity for Cooking.

At the same conference, Dr. Harold Hartley remarked that the gas cooker, which has replaced the coal range in millions of cases, offers the cheapest and most convenient means of carrying-out domestic cooking, and is applicable to all classes. A cooker of the present day will show a saving of from 25 to 33 p.ct. compared with those of the pre-war period. It is possible to bake six 2-lb. loaves for 1d., using gas at 10d. a therm. Even with electricity at 1d. per unit, it costs from two to three times as much to cook with electricity as with gas.

The following figures conclude these few notes. They constitute perhaps the best argument in favour of gas.

Output of Gas in the British Isles.

Last year	281,874,000,000 c.ft.
The year before	269,602,000,000 ,,
Increase	12,272,000,000

Number of Consumers.

Last year	8,502,069
The year before	8,406,172
Increase	95,897

Cookers and Grillers Supplied.

Last year	5,450,093
The year before	5,133,190
Increase	316,903

Cookery Demonstrations at Glasgow.

Our thanks are due to Mr. E. Edison Stones, Assistant General Manager of the Glasgow Corporation Gas Department, for the two photographs which are reproduced here. One is an external view of the windows of the showrooms in Sauchiehall Street, Glasgow, showing the number of people attracted to the windows during the cookery demonstrations which are at present being held. The other is a view of the interior of the window. The lady demonstrators are seen at work.

The "interest power" of the display is well indicated by the photographs.

An Elementary Treatise on Gas Lighting.

For the Student Gas Salesman.

[COMMUNICATED.]

CHAPTER 10.

(Continued from p. 84.)

Enough has now been said to indicate that artificial lighting is a keenly-competed business; and while electric light is a strong rival to gas light, the student will do well to remember that it is by no means the *only* competitor. In order that the comparative costs of equal lighting service can be readily calculated, no matter what may be the prices at which gas and electric energy are available, there are given in Table 6 some further data in respect of the now most commonly met-with gas and electric sources. No attempt will here be

TABLE 6.—*Units of electric energy dissipated by two classes of lamps in the production of equivalent lighting service to that given by one therm of town gas utilized in three classes of burners.*

Class of Gas Burner.	Class of Electric Lamp. (1) Metal Filament Vacuum Lamp. (Units).	Class of Electric Lamp. (2) Metal Filament Gasfilled Lamp. (Units).
(*a*) Low-pressure inverted incandescent burner .	5·000	2·640
(*b*) Low-pressure inverted incandescent preheated cluster burner	7·812	4·125
(*c*) High-pressure (80 in. W.G.) inverted incandescent preheated burner	11·960	6·283

NOTE.—Efficiency of gas burners rated in terms of m.h.s.c.p. Efficiency of electric lamps rated in terms of m.h.c.p. The lighting services provided by 1 therm of town gas when utilized in burners (*a*), (*b*), and (*c*) were given in Table 2 as 4000, 6250, and 9520 candlepower-hours, respectively.

made to offer any elementary explanations as to the nature of electricity itself and the methods and machinery whereby it is (as we say by a common misnomer) "generated"—*i.e.*, made available for the performance of work. These involved subjects are obviously outside the scope of this treatise; and it must suffice for us to limit ourselves to a brief consideration of electric light and of the principal methods of applying electric energy to the production of light. Quoting from "Modern Electrical Engineering":†

> "There are various forms of light produced by means of electricity. The sparks from an electrostatic machine, or those from a charged accumulator of Leyden jars, give intense light of which lightning flashes are only a magnified example. The discharge of an induction coil through tubes from which the air has been partially removed gives light of great beauty. Light can also be obtained by passing through a platinum wire a current sufficiently strong to raise it to a red or white heat. But the name 'electric light,' however, has generally been applied to the light obtained from the incandescent electric lamp or from the larger and more powerful light of the arc lamp."

Let us then direct our attention to these two principal kinds of electric light sources, deferring for a few moments any thought of how the light is produced.

INCANDESCENT LAMPS.

For a number of years the incandescent lamp with a filament of carbon (usually referred to as the "carbon glow lamp") held the field; but its efficiency was of the low order of 4 watts per c.p. As time went on, it was found possible to improve upon this poor efficiency by using another substance for the filament; and in the "Nernst" lamp—sometimes spoken of as the "Nernst glower"—an efficiency of about 2·15 watts per c.p. was obtained with a filament of zirconium.* Unfortunately, however, zirconium filaments were very fragile; they were easily broken, and with the advent of the metal filament lamp the manufacture of the "Nernst" lamp was discontinued.

An important advance was made in the manufacture of incandescent electric lamps when it was found that the metals tungsten and tantalum provided strong and suitable filaments which could be run at much higher temperatures than were formerly possible, thereby enabling manufacturers to produce lamps having efficiencies varying from 1·5 watts to 1 watt per c.p.†, according to the size of the lamp. But within recent years the efficiency of the incandescent electric lamp has been still further increased. Gasfilled lamps—known originally as "half-watt" lamps—have been placed upon the market; and they have an actual efficiency of 0·6 to 0·7 watt per c.p.

In this latest type of lamp the bulb, instead of being exhausted of air in the usual way, is filled with argon (one of the rare gases of the atmosphere); and the presence of this inert substance makes possible the attainment of much higher filament temperatures than those obtaining in the case of a filament *in vacuo*. And the new lamp differs in another important particular. The filament, instead of consisting of a number of straight threads, is wound in close spirals. The gasfilled lamp represents on the face of matters a noteworthy improvement upon other incandescent electric lamps in regard to running costs; but to secure this economy of current the intrinsic brilliancy of the source of light has been increased to such an extent as seriously to endanger the eye, should it be exposed for any length of time to the naked filament. Ordinary metal-filament lamps in their unscreened condition are known to affect eyesight adversely; but gasfilled lamps are much more harmful—their "glare" is blinding, and properly to utilize them, their intrinsic brilliancy has to be so much reduced by the use of diffusing auxiliaries that they are not as economical as they may at first appear to be. Metal-filament lamps both of the ordinary and the gasfilled types are manufactured in certain standard sizes covering a wide range. "For the higher voltages (200 to 260) in general use the smallest size is 15 watts, giving about 11 c.p.; the sizes above being 20, 30, 40, 60, 80, 100, 200 watts upwards to 1000 watts." "For the lower voltages (100 to 130) the smallest is 10 watts, giving about 8 c.p.; the other sizes being the same as for the higher voltages." "Miniature lamps may be had in sizes from 1 c.p. upwards, but these are only for pressures up to 25 volts, and must be connected in series when used on higher pressures." [Extracts from "Modern Electrical Engineering."]

ARC LAMPS.

We are told on the authority of the contributors to "Modern Electrical Engineering" that "the candle-power of the open-type arc lamps with opalescent globes while nominally 1000, is not found in practice to be more than 680, taking the measurement at the most favourable angle—*i.e.*, 45°. The modern flame-arc lamp has an efficiency of about 5 c.p. per watt—*i.e.*, the 10-ampère lamp will give a mean hemispherical candle power of 2500 to 2800. The number of hours burning with one trimming may be from 16 up to 18 hours, and they can be run eleven or even twelve in series on 500 volts. If the old type be compared with the flame type, it will be seen what a great advance has been made. In the first place there is about four times the amount of light for the same consumption of energy; and secondly, with one trimming, 120 to 140 hours burning is obtained, as compared with 34 hours. The main feature of the long-burning flame arc lamp is the magazine. Each lamp has two magazines of light sheet-metal construction to hold the positive and negative carbons respectively. In the 120-hour type the carbons are 15 in. long, and fourteen to eighteen pairs go to one trimming. The carbons are held in place by a spring, and are pressed by it towards the inner end of the magazine." "The feed mechanism takes hold of the inner carbon, and gradually, as it is consumed, works it out. When the stump falls out, the next carbon comes into position by the pressure of the spring, and is ready to be fed out, and so on. Arc lamps are generally used for the lighting of large open spaces, workshops with high roofs, railway stations, &c., and, of course, for public street lighting. These lamps are not in general use for the lighting of halls or ordinary interiors. In order to obtain good light distribution, when units of large candlepower, such as flame-arc lamps, are used, these should be placed at a considerable height from the ground. In the case of a 10-ampère lamp of (say) 2800 c.p. the distance should be 30 ft., and of an 8-ampère lamp (say) 25 ft. from the ground—smaller sizes in proportion." "Flame-arc lamps are usually provided with inner and outer globes, and the inners are made to serve a double purpose. First, as the light from a flame-arc is even more concentrated than that of the old type at an angle greater than 45° from the horizontal, it is necessary to deflect some portion of the rays at smaller angles to widen the area of distribution. Makers have adopted inner globes to effect this; some using plain glass, others globes with facets moulded on the outer surface of the glass, and known as dioptrics. Secondly, if the globes have air-tight joints at top and bottom, they serve to protect the outer globes from the fumes from the carbons, which would condense on the colder surface of the outer globes and actually have an etching effect on them, making them in time opaque." "The globes for flame-arc lamps should preferably be of clear glass."

The efficiency of arc lamps varies a good deal according to the size and design of the lamp; and a comprehensive statement of the performances of arc lamps in general (abstracted from "Modern Electrical Engineering") is given in Table 7. The efficiencies of the modern mercury-vapour lamp and neon-tube are also listed; but time does not permit our considering these special sources at further length.

Though the materials and methods employed in the production of artificial light may, on the face of matters, appear different, all the sources listed in Table 5 evolve light as a result of incandescence.

† Prepared under the editorship of Prof. Magnus Maclean, M.A., D.Sc. (1918.)

* Zirconium is one of a group of the so-called "rarer earths," having peculiar powers of light emissivity; and it was referred to in regard to gas mantle manufacture—see Chapter V., "SALESMAN," for May 30, 1923.

† The efficiency varies according to the size of the lamp; but a fair average figure to take is 1·25 watts per c.p. (m.h.c.p. rating).

Table 7.—*Performances of Electric Arc Lamps.*

Type of Lamp.	Current in Ampéres.	Mean Hemispherical Candlepower.	Watts per M.H.S.C.P.
Open arc, continuous current, pure carbons	6 to 15	360 to 1300	0·9 to 0·65
Open arc, alternating current, pure carbons	8 ,, 20	255 ,, 645	1·58 ,, 1·1
Enclosed arc, continuous current, pure carbons	4 ,, 6	315 ,, 595	1·4 ,, 1·1
Open arc, continuous current, flame carbons	8 ,, 12	1890 ,, 3500	0·23 ,, 0·19
Open arc, alternating current, flame carbons	8 ,, 12	1125 ,, 2295	0·37 ,, 0 25
Quartz mercury vapour, continuous current	2·7 ,, 3 5	900 ,, 3600	0·30 ,, 0·22
Neon tube, alternating current	..	..	0·5 (m.s.c.p.)
Moore tube, alternating current	..	..	1·7 ,,

Note.—"In the alternating-current arc, the 'crater' forms upon each of the carbons in turn; and as there are two brief periods of extinction during every cycle of the current, the mean temperature of the carbons is lower than that in a continuous-current lamp. As a result, the efficiency of the alternating arc is lower than that of the continuous-current type. Further, the current taken by an alternating-current arc may be from 10 to 25 p.ct. greater than that taken by a continuous-current arc to which the same electrical power is supplied." (Arthur Blok.*)

The process that is common to all of them is that something is made very hot and shines only because it is very hot." (Prof. Thompson). In other words, light from these sources is a secondary effect of heat. But the amounts of heat-energy required per unit quantity of light produced vary very considerably with different sources—as will be seen from the few examples given in Table 8; and hence the dissimilar luminous efficiencies of various luminants quoted (according to lux) in Chapter 2, "Salesman for August, 1922.

Table 8.

Source.	Energy (expressed in terms of B.Th.U.) Expended in the Production of One Candlepower-Hour.
Commercial (stearin) candle	308*
Paraffin flame-lamp	147†
Low-pressure inverted incandescent gas burner	25
High-pressure ditto	10·5
Ordinary metal-filament electric lamp	4·27
Gasfilled ditto	2·26
Flame-arc electric lamp	0·91

* After Dr. L. Bell's statement of 90 watts per candlepower.
† According to Prof. Wedding.

It is hoped that students will now have appreciated the point that the cost of producing artificial light by the sources referred to in Table 5 is directly related to the cost of generating heat. This explains why electric light is so much more costly than gas light. Though electric sources require to be supplied with far less heat-energy than incandescent gas sources to produce equal amounts of light (for example the gasfilled incandescent lamp expends 2·26 B.Th.U. per candlepower-hour, as against 25 B.Th.U. per candlepower-hour expended by the low-pressure inverted incandescent gas burner), the superior thermal efficiency of electric sources does not make electric light as cheap as gas light, simply because the transformation of electric energy into heat is a far more expensive process than the generation of heat by burning gas. For example, 1 B.Th.U. produced electrically costs, with current at 5d. per kilowatt-hour, 0·001462d., as against 0·00008d. were it generated by burning gas costing 8d. per therm; but, of course, the comparative costs of producing light would not be in proportion to these figures, because, in the case of electric sources, one unit of heat produces more light than the expenditure of a similar quantity of heat by gas sources.

The student will now have observed that the heat required to make light may be derived either by chemical or electrical means. Sources Nos. 1 to 5 (inclusive) in Table 5 are termed combustible illuminants. Heat is generated by combustion—a chemical action described in Chapter 2, "Salesman" for July, 1922; and in all these cases solid bodies, either present normally in the flame or else added to it, are rendered white hot by the temperature of flaming gases.* Sources No. 6 are electrical illuminants. Heat is produced by electric energy; and combustion has nothing to do with the heating effect produced when a current of electricity is forced through resistant conductors. In the case of incandescent electric lamps, fine threads of resistant conductors such as carbon, tungsten, tantalum, &c. (termed the "filament"), are employed to oppose the flow of an electric current; and the energy expended in overcoming this resistance is transformed into heat. The filaments therefore become very hot and radiate light waves; but they do not burn away, because they are placed in bulbs which have been either exhausted of air or filled with an inert gas.

In the case of electric arc lamps of the "ordinary" or "plain carbon" type, "two stout pencils of carbon (known as electrodes), joined by wires to the electric supply mains, are made to touch one another for an instant, and then are parted asunder to about $\frac{1}{8}$ in." "The current forms a sort of flame—called the arc—between the carbon tips; and the tips, particularly that of the positive pencil, become white hot."† "The electric arc consists of a column of conducting vapour which is derived from the substance of the electrodes and conveys the current across the gap between them. With plain carbons the arc itself, although extremely hot, is almost non-luminous . . . and by far the greater part of the light is derived from the small and intensely hot area or crater which forms on the positive electrode at the place from which the arc springs. The candle-power of an arc depends upon the current passing through it, as this determines the area of the crater and the temperature of the glowing tips of the carbons. By enclosing the arc in a glass vessel, so as to retard the rate of combustion of the carbons,‡ the burning hours may be greatly increased, but at the same time the efficiency of the lamp is diminished."§

Coming now to the electric arc lamp of the "flaming" or impregnated carbon type, we find it to be more highly efficient than the ordinary carbon lamp just discussed, on account of the fact that the electrodes are of special constitution, whereby the arc itself, instead of being almost non-luminous as is the case with plain carbons, is rendered highly luminous. "The arc between pure carbon electrodes is exceptional, as carbon is the most refractory substance known, and is one of the very few that passes directly from the solid into the gaseous state at atmospheric pressure. Thus any substance fed into the arc is volatilized, and will give its own spectrum superimposed on that of the arc and carbons; and this is what obtains in the case of the 'flaming' arc lamp." Now the colour of the light given out by the latter lamp depends upon the material fed into the arc. The yellow flame-arc is obtained with calcium fluoride, while salts of cerium and strontium yield white and red arcs respectively. In the manufacture of flame carbons the particular salt selected is mixed with finely-divided carbon, and is made into a paste with potassium silicate; and this mixture is then forced into a cylindrical casing of carbon, and is dried. With flame carbons "the emission of light is far more efficient, as, in addition to black body radiation from carbon—the only useful source of light in the pure carbon arc—selective radiation* takes place, depending upon the materials used, from 30 to 35 p.ct. of the light coming from the arc itself,"† as compared with about 5 p.ct. only when plain carbon electrodes are used. But lest we should be tempted further to depart from our primary consideration of costs, let us conclude this instalment by finally reviewing our tabulated data.

It will be noticed in regard to Tables 5, 6, and 7 that there is no common basis for rating the efficiencies of the various light sources under review. The difficulties experienced in endeavouring to arrive at a standard measure of luminous intensity equally fair in its application to a collection of different sources was intimated in Chapter 9, "Salesman" for July, 1924; and the student wondering why some values are expressed in terms of m.h.c.p. and others in terms of m.s.c.p. or m.h.s.c.p. will probably find this doubtful point answered by referring to certain quotations from Dr. L. Bloch's "Science of Illumination," as given in the July instalment of "An Elementary Treatise on Gas Lighting." The cost figures advanced in Table 5 (relating, of course, to performances of unscreened sources) afford, it is hoped, evidence sufficiently accurate to support in a general way the point made earlier as to the relative cheapness of incandescent gas-light in regard to running costs.‡ But there are matters other than that of relative cost upon which the buyer of artificial light should be informed; and in the next instalment the writer proposes to speak principally of town gas and electric sources in relation to their relative quality, reliability, safety, convenience, and hygienic value.

* See "Elementary Principles of Illumination and Artificial Lighting." (1914.)

* See remarks on luminous flames in Chapter II., "Salesman" for September, 1922. See also remarks on incandescent radiants in Chapter V., "Salesman" for May, 1923.

† Extracts from "The Manufacture of Light." (Prof. Silvanus P. Thompson, D.Sc., F.R.S.).

‡ The combustion of the plain carbons adds nothing to the light.

§ Extracts from "Elementary Principles of Illumination and Artificial Lighting." (Arthur Blok.)

* It is this selective radiation which gives the arc its particular colour.

† Extracts "Modern Electrical Engineering."

‡ Notice that these are costs in respect of producing light and not of utilizing it. The proper utilization of light (the primary function of illuminating engineering) calls for the equipment of light sources with globes, shades, and reflectors; and these accessories reduce the luminous output of sources. Furthermore, the utilization efficiency of different systems of lighting—as for example "direct" and "semi-indirect"—are widely dissimilar; and it has been argued therefore—and rightly so from an illuminating engineer's viewpoint—that relative costs of artificial lighting systems should not be made on the basis of rival unscreened sources giving so many candlepower-hours for so much money, but that costs should be compared in terms of the intensity of illumination (*i.e.*, the number of foot-candles) provided on the working plane by complete lighting systems. Unfortunately, when generalizing, one cannot do this owing to the several varying factors which have to be taken into account when utilizing manufactured light; but wherever possible running expenses, as well as installation costs, should preferably be compared on the basis of providing a predetermined mean illuminating duty. However, the figures in respect of unscreened sources offer an index as to the comparative costs in this latter connection. More will be said later on the subject of utilizing light sources.

(To be continued.)

N.B.—*See important correction on* p. 120.

B.C.G.A. Gas Salesmen's Circles.

Southern District—London Area.

The May Meeting of this circle took place on May 5, at No. 30, Grosvenor Gardens, S.W.—Mr. Stephen Lacey, of the Gas Light and Coke Company, presiding.

The Chairman, in opening the proceedings, said they would remember that, at the Gas Salesmen's Conference at Wembley last year, Mr. F. W. Goodenough stated that there were two subjects which he regarded as particularly suitable for discussion by the circles during the present session. The first was the relative efficiency of heat production and utilization by means of gas and electricity. This question the circle had discussed at an earlier meeting of the session; and he thought the paper he had read on that occasion, and the discussion which followed, had served to remind them all of the unshakable character of the foundations of the gas industry, and had encouraged them to strive confidently for the attainment of the ideal that the "B.C.G.A." had so eloquently and so persistently preached—namely, "Gas as a public service." It seemed to him that the chief value of those phrases—such as "Service" and "The consumer first"—that symbolized this ideal was that they led to an attitude of mind which on the part of the gas undertaking led to a right policy, and on the part of the staff and workmen led to a determination to see this policy translated into action. He thought the "acid test" to-day of right policy on the part of the gas undertaking was to be found in the answer to the question, "What is being done about the inspection and maintenance of gas appliances?" Now the inspection and maintenance of gas appliances was the second subject suggested by Mr. Goodenough for discussion; and those present were looking forward with great pleasure to hearing what Mr. Davis had to say regarding the work his Company had done and were doing in this connection.

MAINTENANCE OF CONSUMERS' APPLIANCES.

By J. Davis, Outdoor Superintendent of the Sutton Gas Company.

Essentials.

A maintenance scheme, to be thoroughly effective, should cover all the gas apparatus installed throughout the consumers' premises, whether their own property or the property of the gas company. The service should be systematic and regular, and, above all, carried out by competent, good-class fitters, who should be courteous, polite, and of good address. The men chosen for the work should endeavour to gain the confidence of the consumer, in order to ensure as far as possible that every facility will be afforded the execution of their duties. In my opinion, if these points regarding the human element are not strictly observed, the scheme is likely to do more harm than good. The consumer will gradually lose confidence in the company, should their workman be tactless and carry out his duties in an inefficient manner.

The fitter should be thoroughly conversant with all gas appliances, so as to enable him to answer any questions intelligently that may be asked by the consumer, as even to-day it is really astonishing what little knowledge some of the consumers have of their apparatus. He should also be instructed to give special attention to all wearing parts, such as taps, cup-and-ball joints, and water-slide chandeliers, as it is generally from such sources as these that minute leakages occur which are a nuisance and danger to the consumer, and an inducement for them to contemplate the introduction of electricity.

Objects.

Let us consider the objects of maintenance as applied to a gas company. It is to ensure that the consumer's appliances are maintained in a thoroughly efficient condition, scrapping, as far as possible, all obsolete apparatus, eliminating leakages, and encouraging the use to the fullest extent of the gas apparatus installed; increasing consumption, and incidentally increasing sales; and, furthermore, ensuring a satisfied consumer impressed by the fact that he or she is being served by a company out to give "A1" service. To my mind, a most important point is gained in satisfying the consumer, who immediately becomes the company's best advertising medium.

I am convinced that, without some form of maintenance, gas appliances cannot retain their efficiency for any length of time. It is a well-known fact that numerous consumers throughout the country are dispensing with gas appliances due to the fact that such appliances are not giving efficient and economical duty. In order to maintain our business, we must go to the consumer, and not wait for him to come to us. I am firmly convinced that a maintenance system, however modest, is *the* method of securing the object in view. We have all experienced the consumer who will not trouble to complain, but simply sends a note saying: "Take out your gas appliances, as they are of no use."

Cost.

The question of bearing the cost of the system is debatable on many points. In my opinion, all labour should be free; no charge being made for renewals to the company's property, and only a moderate charge for renewals to the consumer's own appliances. The cost of labour and upkeep of the company's property on the district should be included in the price of gas, as a maintenance system should eventually benefit every consumer, whether supplied by ordinary or prepayment meter.

Sutton Maintenance Scheme.

Now I propose to give you some details of a scheme recently brought into operation at Sutton.

In November, 1924, after careful consideration, the Sutton Company decided to initiate some form of maintenance; and, after much discussion, it was arranged to adopt a combined survey and maintenance. This at first may appear a somewhat ambitious scheme; but it was found necessary for several reasons, known to most of you —*e.g.*, difficulty experienced in keeping accurate records during the war. It was therefore decided that at the time the survey was made the fitter should also make minor adjustments to the gas appliances. This we have proved to work extremely well.

Anything found to be more than ordinarily difficult, or involving the expenditure of a lot of time—such as overhauling circulators or changing obsolete apparatus —is made the subject of a report; and after the necessary arrangements have been made with the consumer, a fitter is sent to execute the job *in situ* or, if necessary, to bring the apparatus to the works.

A card system was decided upon as being the most suitable method of keeping records for our district. The card, 6 in. by 4 in., is filled-in from the existing records, and then checked and corrected by the maintenance fitter; the consumer's own appliances being added after inspecti The cards are indexed and filed in str order, so that they may be easily follow up for propaganda purposes.

A suitable letter was sent to every c sumer. Each letter was signed by Engineer and Manager personally, as was felt that the consumers would rea letter bearing a "live" signature, and consign it to the waste-paper basket— resting place of most circular letters.

About one day is allowed to elapse; a then the fitter calls, and examines and every gas appliance throughout house, including main cock and met He renews all worn parts of the applian where necessary, paying particular att tion to wearing parts such as taps a cup-and-ball joints. He is also instruct to see that the service and meter adequate for the work they are called up to do. Where water-slide chandeliers found to be in use, a modern fitting is su gested at a reasonable price, or alterr tively an offer made to convert the wat slide into a fixture free of charge, th securing the consumer and the Compa against leakage. Labour is free; and or a moderate charge is made for renew to consumers' own appliances. Before newing any parts, the consumer's defin consent is obtained, in order to avoid subsequent dispute.

The fitter has a schedule of prices, that he is in a position to state what t renewals will cost. He is also provid with a receipt book for consumers w wish to pay cash. In fact, we express preference for this method, in order to r duce overhead charges, book-keeping, & to a minimum.

The receipt book is in triplicate, mad up in three colours—white, pink, and blu The white slip is given to the consume either in the form of a receipt if he pa cash, or as a delivery note if he desir credit, the fitter retaining the two dup cates; the pink slip being returned wi his card, while the blue one he retains f his own protection in the book. We ha been complimented by many consume on this being a businesslike method, as receipt is given for cash. Should credit desired, the slip is returned to the consum marked "To enter," so that when t account is rendered there is no dispu with regard to materials used.

From this census and survey it is i tended to develop a seasonable mainte ance, giving special attention to hot wat and cooking appliances in the early sprin and heating and lighting appliances in t early autumn.

Personnel.

The fitters selected for the scheme a men of good address, courteous, and polit and are thoroughly versed in the work r quired of them. They are given speci training in the shops; theoretical and pra tical tests being applied, to judge their su ability for the work before being sent o to the district. They are taught the el mentary principles of salesmanship, t assist them in the introduction of new an up-to-date apparatus, where found neces sary or desirable; and I am pleased to b able to say reports have been received fro time to time which reflect credit on th men employed on this work.

Costs of the Scheme.

The costs of the scheme or system a very difficult to arrive at accurately at th moment, as though a full return is mad of the materials used and time taken, th costs can only be determined approxi

tely, as the latent results from such a eme are without doubt very considere. Furthermore, our experience points a considerable reduction in complaints, reased profit from sales of appliances, l, what is perhaps more important, we ve undoubtedly succeeded in gaining the ifidence of the consumers, as they lize we are out to ensure that every ap- ance is giving efficient service.

Up to April 18, 1925, the amount spent wages was £68 3s., and the number of ises visited 441, which works out at ap- ximately 3s. 1d. per consumer. This ount cannot be taken as a definite rking figure, as the scheme has only n in operation a short time. Over a ger period this sum—3s. 1d. per con- ner—will without doubt be considerably uced. Taking the average consumption consumer per annum, we estimate the t at approximately one-fifth of a penny therm sold.

The number of appliances attended to is follows :

inary meters .	441	Boiling rings . .	16
okers . . .	401	Radiators . . .	21
es	796	Lamps	2
vsers . . .	39	Gas irons . . .	7
culators . .	56	Check slot meters	10
sh coppers .	34		
mers . . .	570	Total . .	2393

The number of new appliances sold or on hire is :

okers . . .	5	Geysers	3
es	10	Wash coppers. .	5
irons . . .	1	Circulators . .	1
liators . . .	1	Lighting burners .	21

l various sundries such as mantles, globes, &c., the value of £3 os. 9d.

In conclusion, I would say I am con- ced that, owing to the keen competition sting to-day, and which will undoubtedly come still more keen as time goes on, very life of gas companies in the future ll be determined by the attention given consumers' appliances, as it is unlikely consumer with satisfactory appliances ll readily spend money on installing ne other form of lighting, heating, or oking ; but the consumer with inefficient pliances will most certainly turn-over to ctricity without even bothering to con- lt the gas companies to ascertain ether some improvement cannot be ade in his gas apparatus.

I am indebted to my chief, Mr. Henry age, for his kind permission to present rticulars and figures.

Discussion.

The Chairman remarked that Mr. Davis s to be doubly congratulated—first, on having oduced an excellent paper on a subject of vital portance ; and secondly, on serving a pro- essive Gas Company. They were glad to wel- ne at the meeting Mr. Henry Gage, the gineer and Manager of the Sutton Gas Com- ny, who had kindly consented to open the iscussion.

Mr. Henry Gage (Sutton) said Mr. Davis's tention in presenting the paper was to pro- ke a discussion. He felt that it dealt with subject which was of vast importance to the lustry to-day. It was not necessary to go ck very far in the history of gas undertakings come to the time when all the literature alt with "What can we do in the retort use and to the various apparatus on the orks to improve their efficiency?" Very tle was at that period said about distribution the burning of the gas when it got to the nsumers' houses. As time went on, how- er, partly owing to the competition of elec- icity, the industry began to realize that, if was desired to improve the position and in- ease the output, it was necessary to attend t only to the works but to the consumers. here was room for men of ability to take up is side of the undertaking, so as to ensure at the consumers were thoroughly satisfied. irectors were gradually led to see that it was paying proposition to appoint such men. ne scheme that Mr. Davis had outlined had en in operation only a very short time ; but ere was no doubt that it would give great tisfaction to the consumers in Sutton.

Mr. C. Harford (Grays and Tilbury) re- arked that no doubt the author had already noted a great falling-off in the use of the phrase "bad gas," or of complaints generally, as the result of his men going round. Did the amount quoted as actual wages paid to maintenance fitters include any supervision? Also, was his scheme extended to slot consumers? If not, he thought it was a pity. The sale of sundries appeared rather low over a period of five months. Per consumer, his (the speaker's) figures were considerably higher. They had a rather different scheme in Grays of getting their costs out ; they worked them out, not per consumer, but per fitting—lighting burners and apparatus of all descriptions. The cost on gas of one-fifth of a penny per therm sold was a somewhat high charge for maintenance. Mr. Davis did not say how he intended to carry on the scheme—whether by monthly or quarterly visits. At Grays they had a system of monthly visits, and found it worked very well.

Mr. A. J. Garward (Portsmouth) said that in his opinion the very fact that most gas companies did a certain amount of free maintenance proved the necessity for a general maintenance scheme. In addition to keeping the manufacturing plant up to date, it was absolutely essential to go right through to the burning-point of the gas, though he was afraid with a very large number of gas undertakings this had not been attempted. With the competition there was now, it was necessary, not only to sell gas, but to give the consumers service at the same time. The only way to do this was to adopt some plan such as the excellent scheme put into operation at Sutton. Did the men who went round attend to incandescent burners during their visits? Also did they look after industrial as well as domestic consumers? Again, did the cost of 3s. 1d. per consumer include attention to hired appliances and the replacement of parts? Some time back his own Company recognized the necessity for a scheme at Portsmouth. They went into the matter very carefully, and decided to experiment with a certain number of houses. They first did 5000, and had since done another 5000 ; and on inspection they found that, taking these 10,000 houses, there was an average of 4·74 defects in each. By "defects," he meant there were this number of faults. It might have been an escape, or a geyser not working satisfactorily. It might have been a cooker that required parts, or some adjustment ; of it might have been a water-slide chandelier which they recommended should be exchanged or made stiff. The cost of this work to date had averaged 2s. 2·80d.—cost of labour 1s. 11·5d., and cost of material 3·39d. This material was included in the cost because it was "free material." When the fitter went round he adjusted hired appliances ; but if any parts were required he noted the fact on a form, and the parts were then delivered and fixed by a separate department. Mr. Davis called his paper "Maintenance ; " but what he had undertaken might be regarded as a "primary inspection." This first visit, he suggested, would prove more expensive than subsequent ones—which he would term "maintenance visits." Therefore the author could look forward to the costs being considerably reduced later on.

Mr. Davis replied that since the starting of the maintenance scheme the phrase "bad gas" appeared to have been dropped altogether ; while complaints generally had been considerably reduced. The figures did not at the moment include cost of supervision ; and they had not so far extended the scheme to slot consumers, though eventually they hoped to cover the whole district—both slot and ordinary. No doubt they would eventually get the price of 3s. 1d. down to a very much lower figure. One-fifth of a penny per therm was only a rough estimate ; and he thought the service was well worth it. Sutton, of course, was a purely residential district. They took the whole house, from top to bottom. The cost given in the paper for labour included renewal parts of hired appliances.

Mr. Garward thought a six-monthly or even a three-monthly period was too long to let incandescent burners go. It became a question whether one should not have a separate system for burners.

Mr. L. H. Holland (North Middlesex Gas Company) said his Company had started a scheme within the last few days, and he thought it was working out very successfully. They had visited Brighton, where there was one of the finest schemes in operation. How many visits per day did the men at Sutton put in, and how many men were there on the work? The preliminary circular-letter was a good idea, in order to ensure admission of the fitters to the houses, though his Company's fitters had not experienced any difficulty in this way.

Mr. Davis answered that jobs varied considerably. Sometimes men did only two per day, and sometimes from six to eight. He thought the average was about four per day over the period for two men. The men carried a copy of the circular-letter, and wore a uniform hat, as well as having their maintenance bags painted "Sutton Gas Company."

Mr. G. S. Gadsby (Gas Light and Coke Company) declared that the finest advertisement for a gas undertaking was a fully satisfied consumer ; such a consumer could only be obtained by keeping all appliances in a state of efficiency, by the aid of skilled periodical maintenance. Apart from cost, of course, one of the great difficulties in connection with maintenance was the equalization of the labour load throughout the year.

Mr. W. R. Moger (Tottenham) : Do your two men go together, or do they work separately? Is each job a man goes to on a particular day done on that day? If not, there must be considerable waste of time.

Mr. Davis did not think there was any waste. As explained in the paper, about one day was allowed to elapse after the sending of the letter, and then the fitter called and did the work. Sending a man beforehand would increase the cost.

Mr. Moger said that such a man would do minor things, but report back material required to the second man who was coming along. He himself would regard from two to four jobs a day as being rather low.

Mr. Davis : The men are going to houses that have been unattended to during the war. Later on we shall hope to do more.

Mr. Moger : I think if a man went forward and reported material required, it would help considerably.

Mr. Davis : The houses so far attended to have mostly many appliances in them.

The Chairman said he regretted the unavoidable absence of both Mr. Creasy and Mr. Becket. Referring to prepayment installations' inspection, he stated that his Company accepted special responsibility in connection with automatic supplies, and were doing this work very thoroughly. They had already got through some two-thirds of it. They were now sending out about 7000 lighting fittings weekly, for replacing obsolete patterns. So far as the ordinary consumer was concerned, the Company's work began really in 1907, when the Special Service Section, which Mr. Creasy so ably directed, started giving particular attention to doctors, architects, and similar professional men ; and in 1914 they commenced to deal in the same sort of way with the industrial consumers. In 1921 they started a thorough examination of the whole of the ordinary supplies. He would ask Mr. Ardley, who was connected with this branch of work, to give the meeting some particulars of what was being done. It had been urged in the course of the discussion that lighting burners should be maintained once a month. This, however, appeared to him (the Chairman) a little difficult, on the ground of cost. Judging from his own experience of the cost of thoroughly examining and putting in good order a lighting burner, he would say that if they were to do this free twelve times a year, the whole of the profit on the gas consumed through the fitting would be more than absorbed. This would, of course, make the maintenance of lighting burners free an impossibility. Generally speaking, prepayment consumers could be relied upon to look after their burners, if they were given good ones ; and they could be inspected at much less frequent intervals than once a month.

Mr. R. P. Ardley (Gas Light and Coke Company) agreed that there was a good deal of looseness in the use of the word "maintenance." Often what was meant was inspection, which was a different thing altogether. His Company early recognized that it did pay to undertake a certain amount of free inspection, of a limited number of appliances at least. It might be possible one day to do it for all consumers ; but at the start they did it for special classes—professional men who came in contact to a large extent with the public, and by whom public opinion was led. The final upshot of this was that, having been found to pay, it was decided to extend the plan to as many as possible of the ordinary consumers. They tried it on one district, to see how it would go, and the results, after about eight months' work were so satisfactory in all respects, that it was immediately put into operation in fourteen dis-

Reduce your Maintenance

tricts; and since then it had been extended still further, to 52 districts in all. They adopted a letter on the lines of that alluded to by Mr. Davis in his paper, and found some such plan was necessary to secure entrance to premises in all cases. In fact, they even went so far as to put the representative's name on the letter itself. It would be rather useful to set-up some definite plan for costing these things. Of course, the first object of his Company was service to the consumer.

Mr. L. RENDELL (Gas Light and Coke Company) remarked that the author quoted 3s. 1d. per consumer as the cost, and said the average number of jobs was about four a day, carried out by two men. This would be 12s. a day, to be spread over two men and material.

Mr. DAVIS pointed out that the men now employed were young men trained in the shops, who were not yet getting the full rate of wage. They were thoroughly trained, and as they went on it was hoped to increase their money.

Mr. E. L. OUGHTON (South Suburban Gas Company) said that in 1912, when he was in Yorkshire, they had a free maintenance system —free labour, but the full showroom price charged for all articles sold. In order to attack a problem like this successfully, they must be whole-hearted; and therefore he was glad to see "all" the gas apparatus mentioned in the paper. Maintenance demanded the very best man possible. He should be skilful in his adjustments, and in explaining to consumers the ins-and-outs of the appliances. When this was the case, one could lengthen the period between maintenance visits. If gas undertakings did not keep in contact with their customers, they would lose business; but with efficient men, who would tell the consumers how to reduce their gas consumption within proper limits, they would make friends. He wondered sometimes whether it would not pay large undertakings to charge the net cost of appliances, *plus* overhead charges. Inspecting the main cock and meter was most important, and so was attention to ball-and-socket joints. He did not think the labour charges, for a first inspection after a long period, could be regarded as very high, because it seemed that a really good job had been made of it; and as the scheme went on, the costs would be materially reduced. At the same time, a man who had to represent a gas company in this way was entitled to the best remuneration for his services.

Mr. DAVIS said that for material used on maintenance they also charged full showroom prices, which they regarded as reasonable. The maintenance scheme had caused them to scrap a large amount of apparatus — including cookers.

Mr. F. PICKERING (Rochester) said his Company had had burner maintenance in operation for a few years, and there were now some fifteen men who did nothing but clean incandescent burners and glassware. In private houses all the burners were attended to once a month, shops fortnightly, and in a few odd cases weekly. There were a very large number of outside lamps; and the Company were particularly keen on keeping them in good condition. They were careful to polish the tops, which was important. Labour was given free, and materials were charged for at ordinary showroom selling prices. Three years ago they started on a census; the men doing nothing more than take information. It was found that they could do fairly thoroughly from thirty to forty houses a day. Following on this, they started to maintain gas fires and other apparatus. With regard to cookers, they had not yet a complete maintenance scheme, but he hoped that shortly it would be in operation. The best man that could be got for the work was none too good.

Mr. DAVIS said his Company had a scheme of this kind for outside lamps, which was very successful. They cleaned them once a week.

The CHAIRMAN pointed out that with certain classes of apparatus care should be taken that the gas consumption was limited to that which was most suitable to the appliance. It seemed to him that the question they had been discussing bore upon hire and hire-purchase. If gas undertakings were going to be responsible for appliances, it was certainly desirable that they should be able to scrap them when they became obsolete. Hire and hire-purchase should be limited to the very best class of appliances, and should be applied only to houses the occupiers of which were likely to look after them. He suggested that it would be well if they could get together and see how hire rates were arrived at. They varied enormously for the same apparatus in different districts. Did Mr. Davis's hire rates provide a margin for work of this kind?

Mr. GAGE replied that for cookers or other appliances they took as a general rule the total cost of the apparatus, and charged for hire about 10 p.ct. per annum on this. It paid them fairly well.

The CHAIRMAN said this appeared to him extremely small, unless one was putting in apparatus which it was considered would not become obsolete, and would last for (say) twenty years. In the past, of course, much apparatus had been taken out because it had become obsolete. They wanted a margin sufficient to enable them to do free maintenance.

Mr. J. C. WALKER remarked that they were more or less agreed that maintenance was a necessity, if business was not to be lost. After they had gone to the trouble of persuading a consumer to let their representative have the run of his house, they should certainly utilize this opportunity for securing new business, wherever possible; and therefore the men employed on the work should be of a good type, with some experience of salesmanship. It should be one of the functions of the gas company and of their representative to encourage consumers to complain when they had cause for complaint. They should be continually telling the consumers what they were prepared to do for them. It would be interesting to know whether there was any record of the influence of maintenance on consumption.

Before the meeting separated, Mr. Davis was, on the proposition of the CHAIRMAN, heartily thanked for his paper.

West Riding of Yorkshire Circle.

A Meeting of the Circle took place on May 13.

Prior to the business meeting the visitors were entertained at tea by the Elland-cum-Greetland Gas Company, following which the business proceedings were presided over by Mr. S. H. PACKER, Chairman of the Circle.

The CHAIRMAN said the members were glad to come to Elland, because it meant renewal of acquaintanceship with Mr. Bridge, who had opened their session with a paper at Bradford.

Mr. J. W. H. Fox, Vice-Chairman of the Company, offered a cordial welcome to the members, and extended the apologies of the Chairman of the Company (Mr. W. E. Dyson) for his unavoidable absence.

Mr. J. BRIDGE, Engineer and General Manager, added a brief welcome.

SALES AND SERVICE OF THE SMALL UNDERTAKING.

By J. W. HOLROYD, of Elland.

The large undertaking can employ specialists as salesmen whose activities are solely confined to this work. This, however, is not possible in the smaller-sized concerns; and in Elland, the salesmen are the distribution superintendent, the collector, the showroom clerk, and all men on district, who are really potential salesmen.

The distribution superintendent is responsible to the Engineer and General Manager for all work connected with the undertaking from the gas leaving the works to the point of utilization, excepting collection, stating, and clerical work therewith. In addition, it is his duty to canvass the district, calling on industrial, as well as domestic, consumers. At the time of the canvass or other interview, the consumer is advised of the apparatus most suitable for his particular needs. If an order is obtained, particulars are taken of the material required to execute the work. It is therefore of great importance that the practical training of such a man should be as good as his theoretical knowledge. By the policy adopted we obtain a closer personal touch with the prospective buyer. He clearly sees that his requirements are receiving attention by the chief officials of the Company, and, knowing this, realizes that any promises given, or statements made as to the cost of the work and when same can be carried out, will not lead to disappointment. Such an understanding invariably clinches a sale, while an evasive reply of "within a day or so" might lose the order. The distribution superintendent supervises all main and service laying, and is responsible for the recording of this work on the Ordnance maps and in the books. He is consequently familiar with the conditions prevailing in the district while carrying out any canvass, and is favourably placed to diagnose any trouble occurring as to insufficiency of supply, &c., caused by overloading of mains and services. It is also his duty to get the fitters out to work every morning, having prepared their lists of work over-night, and also to visit these men during some part of the day, to inspect their work while it is in progress. The work and time sheets of the previous day are prepared for the Engineer and General Manager's inspection before 9.0 a.m.; and thus we are able to keep closely in touch with the actual working hours of each man, his unproductive time, and, generally, his value to the Company. The smaller undertakings certainly can give more personal attention to the consumers; and our work at Elland has given rise to good feeling. The consumers appreciate that, if they want a job done well, the Gas Company can do it.

In our undertaking the collector is a man of good education, and, having been connected with the distribution department for many years, is to us a salesman of no mean order. The collector has splendid opportunities of doing business or paving the way for business. On many occasions it has been found that orders received are the result of information and advice given by the collector while carrying out his duties. Besides delivering accounts and receiving payment for them, he receives any complaints from the consumers; and his timely reports and advice prevent dissatisfaction.

The showroom clerk is an understudy to the distribution superintendent. He has had practical experience on the district with the gasfitters and maintenance staff.

Even the smallest undertaking should have a showroom; but in a scattered district like ours, it is not as beneficial as we should like it to be, there being many consumers in the out districts who never come to Elland. You will readily understand this when I point out that three of our outlying villages, representing practically 50 p.ct. of our sales, are in direct communication with either Halifax or Huddersfield by tram and 'bus, and in consequence shopping is done at the larger towns. Our present showrooms are rented premises, situated in one of the main streets of Elland. They have a good frontage, allowing a neat window display; but the interior is unfortunately very small, and does not allow enough room for a representative show. However, in the near future we hope to erect showrooms on a plot of land recently purchased in the main shopping thoroughfare of Elland. During the recent lighting season, we made a special feature of lighting the exterior of the showrooms by 3700 c.p. lamps, and at the same time started a campaign for outside shop light-

ng. Our own display had the desired ffect, and easily converted shopkeepers to he scheme. The scheme is to supply on imple hire 700 c.p. lamps, fixed free, at rental of 30s. per annum—10s. per uarter for the two winter quarters, and s. per quarter during the two summer uarters. The agreement is for 3 years. Our total for the first season was 21; and ve feel sure this number will be considerbly increased in the near future. Our howroom window is re-dressed at least nce a fortnight; and the display is made o coincide with the advertisements apearing in the local Press.

Besides advertising in the local "Adverliser," which has a circulation of 4000 opies each month, we have a full page in ach of the different Church magazines, nd the "Free Church Journal," which ave a circulation of over 1200 each nonth. With every gas account we send ut small seasonable advertisements, and t times make use of the well-known 'B.C.G.A." stamps. Where any accounts re sent through the post, we utilize the llustrated envelope, so that every availble source of local advertising is in constant use. We have no doubt that this ays. We must keep our goods before the ublic; and the way to do it is to give hese goods the publicity they merit.

Our undertakings are known as public ervice undertakings. Let us live up to his name, and give that quality of service vhich in the future will stamp our inlustry as a key industry. To attain this uality of service in the highest degree is he aim of my Chief. For the past six nonths the distribution superintendent, in conjunction with the Engineer, has given morning talks two mornings per week to ll members of the service staff. Those alks have already covered a wide field; nd it is intended that they should deal vith the whole subject of service. In order to get the best out of each man, it is necessary to give even the humblest and he youngest an opportunity of knowing as much as possible about his business nd the policy of the undertaking.

The aims of a gas service department hould be such that:

1. Orders are executed promptly and fficiently, to the satisfaction of the conumer. A consumer must not, and will ot, be neglected. He must have the best f attention, or we must expect to lose im. This is so obvious that some may e tempted to doubt the necessity of tating it; but there is no denying that lack conditions still prevail in many ndertakings.

2. That information of a reliable nature eaches the superintendent from the disrict relative to complaints and the general eeling of the consumers to the underaking.

3. The staff are properly trained and vork in harmony. Loyalty of the staff is est obtained by the attention which is hown by the chief.

4. Only approved goods are stocked, nd these sold at a reasonable figure, so hat we may protect the consumer from hoddy goods.

5. We are ever in the minds' eye of preent and prospective consumers. Make hem feel that their personal interests and omforts are being studied, and that, if a ob has to be done well, the gas company re the people to do it.

It is well to remember that the public udge the quality of the gas by the results hey obtain with their appliances. In the nterests of service we must examine eriodically each appliance on the district, o see that it is giving the highest effiiency. Hence the necessity for an organzed maintenance scheme. We have a cheme in operation employing four specilly-trained men. They have just comleted a round of the whole district. For he first visit an entrance to each conumer's house was gained by presenting a folder expounding the scheme, having a detachable back leaf in the form of an agreement, requesting the Company to clean a specified number of burners periodically. The fact that 2000 of these agreements have already been signed and returned to the Company proves that the consumer does appreciate service. The folder and form only state incandescent burners. However, we had no intention of confining our activities to lighting alone; and once in the house, we take the opportunity of inspecting, overhauling, and maintaining every piece of gas-consuming apparatus, whether or not it is owned by the Company.

We have a special gas-fire maintenance scheme, by which all consumers' fires are cleaned and adjusted three times during the winter season. Despite the poor trade in the town, where some of the mills are closed and others working restricted hours, our maintenance men have helped to increase the sales to a great extent, especially in the lighting field. They have introduced up-to-date fittings and burners in place of old ones; and it is a remarkable fact that the introduction of one burner has in several cases been the means of a request to light the whole building. At this point it would perhaps be of interest to mention a few of the larger sales we have negotiated this last season:

Three churches re-lighted, introducing distance control.

A sanitary pipe works re-lighted with 35 "Littleton" lamps of various sizes, 21 of which are on separate distance controls.

A factory re-lighted with 89 factory lights.

In addition, we have been fixing cookers, fires, and boilers at a rate of not less than one per day—and this in a district where coal is cheap and easy to obtain.

Arrangements are in hand for an exhibition to be held in September or October. It is a debatable question what part of the year is most suitable for a small undertaking to hold an exhibition. Gas is now so widely used that every day is a gas day. After consideration, we have decided that the commencement of the gas-fire season will be the best, for the reason that we then get two main lines that are seasonable—fires and lighting. We shall therefore have a special fire and lighting display, but shall not by any means neglect the cooker display, which will be augmented by a series of cooking demonstrations and lectures. Here again the difficulty of a scattered district arises, but my Chief suggests engaging chars-a-bancs, and running to the outlying districts a free service to and from the exhibition, and concentrating the whole of the exhibition in Elland, which represents 50 p.ct. of our sales. By this means we shall do better than by holding small exhibitions in each of the outside villages we supply.

In conclusion let me quote a paragraph which I remember reading a good number of years ago: "You can buy in your armchair, you can keep accounts on a stool; but to sell, you must get up, and get out, and get busy." To my mind, this paragraph sums up the whole business of salesmanship, and is particularly applicable to our policy—we do get out, and we are kept busy.

Discussion.

Mr. F. Lodge (Wakefield), after congratulating Mr. Holroyd on his paper, said he was impressed by the excellent suggestion that collectors should be salesmen. In some cases collectors did not act in this way as well as they might do; and yet there was no man who came into more direct contact with the consumer. The idea of free transport of people from outlying districts to the proposed exhibition was new; and he hoped it would be a great success. He was interested to hear of the maintenance scheme, and particularly the cleaning of fires three times per year.

Mr. H. Rhodes (Bradford) believed in the possibilities of utilizing distribution men as salesmen. He would like to ask what system Elland adopted in regard to the meter difficulty. In Bradford, though the undertaking had taken over a good many meters, a large proportion of domestic meters were owned by the landlord. Many of them were not big enough for the work demanded, but the owners were not willing to instal new ones.

Mr. M. M'Kennerney (Keighley) asked why Mr. Holroyd favoured exterior lighting for shop windows, as compared with inside lighting. Did the collectors at Elland receive a bonus for the orders they obtained?

Mr. J. W. Lupton (Otley) asked whether Mr. Holroyd's maintenance scheme was free. In Otley the people greatly appreciated free maintenance service.

Mr. C. Watson (York) said Mr. Holroyd's paper, though devoted especially to smaller undertakings, was equally applicable to large concerns. There were certain phases of effort which the small undertaking could develop very readily, and from which larger concerns could learn a good deal; and he thought it was good policy for the Circle to have many of their meetings in the smaller towns. He thoroughly endorsed all that Mr. Holroyd said as to good feeling throughout the staff. He thought that high-pressure exterior lighting, while good for public squares, &c., was not the best for shop windows. On the other hand, with indoor lighting there was a liability to steamy windows, unless there was very good ventilation. He thought an excellent indoor window lighting scheme was by superheated burners with six or eight mantles.

Mr. L. Denham (Halifax) said that in Halifax they were keen on high-pressure lighting.

Mr. Lupton, referring to Mr. Holroyd's question as to the most suitable period for a gas exhibition, suggested the early summer, when the cooker demand was strongest.

Mr. Bailey (Cleckheaton) remarked that much success was to be achieved by creating, through education of staff, good gas workmanship. He thought the ideal shop window lighting was exterior, because it attracted people from a distance.

Mr. H. Sykes (Bradford) asked Mr. Holroyd if he gave local plumbers any special encouragement for co-operative working with the gas undertaking. In some municipalities, said Mr. Sykes, the collectors were responsible for gas, electricity, and rates accounts; and he knew of their taking round electricity pamphlets while collecting gas accounts. Did the morning talks at Elland clash in any way with Institution classes in the district.

Mr. Denham said he noticed Mr. Holroyd told his consumers the undertaking would be glad to examine appliances on application. Would it not be advisable to call and examine before application?

Mr. J. R. Firth (Bradford) asked whether it was possible for Mr. Holroyd to give the figures for the last six months of cost of the maintenance service. What means had he of ascertaining the walking time expended by the men, and what was the average of burners per man per day?

Mr. Adamson (York) corroborated the view that outside shop window lighting was most valuable in attracting business.

Mr. J. H. Pickles (Halifax) said another important factor of the value of exterior shop window lighting was that the natural light of day was from the outside; and artificial light should approximate as nearly as possible to daylight conditions. He thought outside lighting added probably 50 p.ct. to the selling appearance of the goods in the window.

Mr. Adamson agreed with Mr. Pickles, and pointed out that the normal window was dressed for daylight.

Mr. M'Kennerney remarked that inside lighting was inexpensive, and could be made most artistic.

Mr. Fletcher (Wakefield) said he had been impressed by the idea of free transport for outdistrict people to the proposed exhibition. Mr. A. E. Mottram, of Ossett, in his recent paper in that town, had suggested taking gas appliances round on a lorry to show to people who would not come to the showroom.

Mr. Watson said there was a good deal to be said for the idea of taking goods to the people, even if it meant holding district exhibitions or opening branch showrooms.

The Chairman (Mr. Packer) said Mr. Holroyd's paper had indicated the enthusiasm, harmony, and efficiency which prevailed throughout the Elland Gas Company's staff.

The first part of the paper seemed to him to bring out a great, but often forgotten, principle —that the whole of the business world rested on confidence. Ignorance was the great cause of lack of confidence; and the way to cure this ignorance was by publicity by way of the showroom and advertisement. Elland was giving a lead to many larger undertakings in the way of local advertisement. When had they heard before of a small undertaking giving regular morning talks to the men? This was one of the most striking points in the whole paper. It was evident from the paper that members of the Elland staff were made familiar with the policy of the undertaking. There was no better tonic for sick sales than systematic staff training, because it made the salespeople interested in what they were doing and selling.

Mr. Bridge congratulated Mr. Holroyd on the paper. Mr. Holroyd was a most valuable member of his staff. The paper was a new departure in that it dealt to some extent with the policy of the undertaking. He thought it was a useful departure, particularly in view of the fact that the efforts of the Circle had been specially concentrated during the past season on behalf of smaller undertakings. Salesmen, as such, were not responsible for the policy of their undertakings, but there was no reason why they should not discuss policy. The maintenance schemes and the education of the gas service men—he liked to call them all by the title "gas service men" and make them all feel that they had an important part in that service—were valuable in enabling all salesmen to study the policy of the undertakings with which they were concerned, and the policy of the undertakings in their district. Mr. Bridge said there was no monopoly of brains in one man in any undertaking; and he gained much valuable help and information from his salesmen and his gas service men generally. At the opening of the session of the Circle he had given a paper in which he had made some suggestions; and he would venture now to make another. The Circle had members who were responsible for many duties in distribution and utilization of gas; and he would urge that they should get a little more from the beaten track, and discuss the policy of gas undertakings. He felt that something very useful would be the outcome. Good service, added Mr. Bridge, warranted good pay. It was a well-known fact that in the gas industry it was easier to fill a vacancy on the engineering or mechanical side with a thoroughly suitable and qualified man than it was on the distribution side. It was up to such organizations as the Circle to prevent this situation existing much longer. Mr. Bridge went on to suggest that, while the industry had no desire to place men "on the shelf" because they were getting older, it was desirable that all undertakings should make schemes of provision for men from the age of (say) 60 years, so that the younger men could have a chance.

Mr. Holroyd, replying to the discussion, said that, in regard to shop-window lighting, the steaming of the window by inside lighting, unless there was good ventilation, was against such lighting. Then again, there was the attraction of people to the shop by outside lights. Mr. Lupton had questioned the period of the proposed exhibition. He thought they would not lose much cooker business because, as Mr. Packer had said, it was now fairly even throughout the year, in addition to which they were going to make a special display of cooker service, in addi ion to lighting, fires, &c. The maintenance scheme was free. The offer to call and examine "on application," was a request to consumers with whom they were already in touch. It was a request. They did not believe in forcing anything down the public throat. In answer to Mr. Sykes, the Elland undertaking worked harmoniously with the local plumbers. One of the latter was at present making a special show of a gas cooker and two fires loaned for the purpose by the Company. The morning talks did not in any way clash with the Institution classes. As to the walking time of the men, this was checked by the time sheets, which recorded the times of starting and finishing every job. They had to trust to the honesty of the men's records. A knowledge of the district was, of course, an excellent check. In regard to the average of burners cleaned per man per day, it varied according to whether the houses were scattered or close together; but a rough average time was twelve minutes per burner. Mr. Rhodes had raised a question as to house meters. This certainly was one of the difficulties of satisfactory gas service. Wherever possible the Gas Company had suitable meters in the houses. Most of them were owned by tenants rather than by landlords.

On the motion of Mr. C. Watson (York), seconded by Mr. D. Parsons (Huddersfield), a hearty vote of thanks was awarded the Chairman, Vice-Chairman, and Directors of the Elland-cum-Greetland Gas Company, and to Mr. Bridge, for their hospitality. Mr. Fox briefly responded.

On the motion of Mr. L. Denham (Halifax), seconded by Mr. Adamson (York), Mr. Holroyd was warmly thanked for his paper.

It was announced that the next gathering of the Circle would be an all-day visit, on June 10, jointly with the Manchester District Circle, to the works of Messrs. Wilsons and Mathiesons, Leeds.

Lancashire District—Manchester Section.

In last month's "Salesman" (p. 93) a brief account of the April meeting of the Circle—at which Mr. Sillitoe, the Chairman, presided—was given. We now publish the papers read at that meeting, and the discussion to which one of them gave rise.

NOTES ON GAS LIGHTING.

By W. B. Payne, of Liverpool.

The competition to-day between gas lighting and electricity is very keen indeed, and we, as gas salesmen, must be in a position to put forward the best possible case for the commodity we are selling. To do this, we must have a thorough knowledge of the most efficient appliances on the market.

Internal fittings should be compact and neat. Solid-drawn tubes only should be used, while all ball joints should be well ground-in and sprung. It is also of importance that all swivels and taps should have a good body of metal.

Each gas undertaking, by making tests, ought to find out the most suitable burners for the gas supplied, and standardize them as far as possible. Cheap burners must be avoided at all costs, for while they often look good, examination soon lays bare the defects. They are not scientifically made, and, as a rule, have a stamped or badly-drilled nipple, a metal nozzle of the same diameter throughout, and are fitted with an iron-wire gauze. The really good burner should have a machined and properly-drilled nipple, otherwise the stream of gas will be deflected towards the side of the mixing chamber, and the efficiency of the burner will be impaired. Owing to their non-conducting propensities, clay nozzles are undoubtedly the best. Lugs or deflectors should be fixed to prevent the products of combustion entering the mixing chamber a second time. The hottest part of the flame being just inside the outer envelope emphasizes the necessity for always using a properly-shaped mantle, the fabric of which ought to be of either ramie thread or artificial silk. Cheap mantles, as a rule, are very badly shaped, and the wise course is to avoid them.

A flame of high temperature can be better obtained by burners of the superheated type screwed into a chamber with a large surface over the heating points. The temperature of the gas and air mixture is thus raised while passing through this chamber. The efficiency of superheated burners is shown by the fact that a cluster of three bijou mantles will give almost twice as much light as a No. 3 standard burner at the same consumption. A further advantage is that, small mantles being stronger than large ones, maintenance costs are brought much lower. In the event of one mantle being broken, there is still left a considerable amount of light.

It may be well to consider here the consumption and illuminating qualities of good inverted burners. The No. 1, or bijou, type consumes approximately 1½ c.ft. per hour, the No. 2 burner 2½ c.ft., and the No. 3 burner 4 c.ft. per hour. The average candle-power per c.ft. is from 18 to 20. Mantles of a larger size than No. 3 should be abolished in favour of cluster burners.

Globes play a very important part in good lighting. Avoid those that are heavily frosted, using only the clear or lightly-frosted types. There is a loss of only 5 p.ct. of light when a clear globe is used, but when coloured ones are in use the loss rises as high as 50 p.ct. The Vitreosil globe answers very well. It is neat in appearance, close to the mantle, and is unaffected by the heat. Another very good globe, though not fireproof, is the Supastone, which is larger and gives better all-round duty.

In dealing with domestic lighting, the colour of the decorations and furniture must be considered. Anything of a dark nature absorbs light; and if these conditions are in existence, provision must be made accordingly. It is generally understood that, for house lighting, 3 to 4 foot-candles over the whole area is adequate. Burners of the direct lighting type should be used on brackets round a room, while for centre lighting those of the semi-indirect type are very good. While the latter method entails a slightly larger gas consumption, the results are more pleasing; and all forms of glare are eliminated. Burners of the by-pass pattern should always be fitted on landings, also in the halls and bathrooms. The switch should be remembered; the pneumatic system being the simplest.

Shop lighting, both inside and outside, requires careful attention. The arrangement of the trading goods, as well as the showcases, must be taken into consideration. A great mistake, and one often made, is to try to illuminate a shop by using the old lighting points. A drop fitting is usually placed over each counter, and one or two in the windows. Lamps of high power are fixed at these points, with the inevitable result that under the lamps a brilliant light is obtained, while the remainder of the premises is left in semi-gloom. We should aim for a light duty of from 4 to 6 foot-candles over the whole floor-space. It is infinitely better to put in new lighting points, and to use a larger number of smaller lighting units to equalize the amount of light over the whole area. For outside window lighting the conditions are somewhat different. The shopkeeper usually desires a blaze of light, not only to illuminate the window, but also to attract attention to his premises. Cluster lamps such as the "Littleton" or similar types can safely be used for this purpose. Their polished copper bodies, enamelled reflectors, superheaters, and neat design all combine to lend an attractive appearance; and the lamps give excellent duty. They are easily cleaned and regulated, and can be obtained with any desired number of mantles up to 15. As an advertising medium they are admirable, while, if required to illuminate a window display, they can be fitted with parabolic reflectors. By-pass levers and chains are usually fitted to these lamps; but if desired they may be controlled by a distant-control device made by Messrs. Sugg, and operated from inside the shop.

In dealing with factory lighting, a 3 to 4 foot-candle duty should be aimed at over the whole area to be lighted. Nothing causes eyestrain quicker than a brilliant light in one part and dark shadows in another; and where industries have to be carried on by means of artificial light, production is impaired if such light is not evenly distributed. Good general lighting tends to make the worker cheerful; and this condition undoubtedly makes for increased production. The danger from machinery in motion in badly-lit workshops and factories is obvious. Overhead lighting is best for this purpose, and can be accomplished by cluster lamps fitted with enamelled reflectors. They should be nicely spaced, and may be controlled by the distance-control device mentioned before, or, if preferred, by-pass levers and chains could be fitted. Anti-vibrators can also be attached for the purpose of absorbing any shocks set up by the operations in progress. In addition to the general lighting, smaller units may be fitted for special purposes such as cylinder boring, planing, or drilling. They should be of the movable type, and fitted with parabolic reflectors to change the direction of the light when required.

Street lighting by gas is more than holding its own; and I think that it is a generally accepted fact that in foggy weather no other form of lighting has the same powers of penetration. In busy thoroughfares the distance between the columns should be 40 yards, while in the suburban areas 50 yards is ample. Here again I am in favour of the cluster burner, both from the illuminating standpoint and from that of maintenance. At street corners and in busy thoroughfares, the "Littleton" lamps, fitted in the ornamental harp supplied by the makers to suit existing columns, give excellent duty.

The question of high-pressure gas for street lighting is also worthy of serious consideration. London, Manchester, and Birmingham have fine examples of this form of lighting. Generally speaking, when gas is compressed to 80 in. water-column, or approximately 3 lbs. pressure, it gives the best duty. Each lamp should be fitted with a by-pass. Lamps can also be arranged in groups of twelve, operated by a control governor. If a compressor is used for street lighting only, it can be fitted with a special loading device which increases or decreases the pressure at will, and enables all the lamps on the district to be lighted or extinguished at one time.

The salesman has something more to do than sell an attractive fitting or lamp. If only a replacement is required, a few judicious questions will soon discover what is the best article for the job. If a new lighting scheme is in contemplation, suitable fittings may be shown and prices quoted, but a visit to the premises by the outside representative is advisable in the interests of all concerned. There are places where electric lighting is more suitable than gas, not from an illuminating standpoint, but purely from the point of view of expediency and convenience. Generally speaking, gas lighting can more than hold its own. It is of the right colour, eyestrain is avoided, ventilation is improved. Moreover, illumination by gas is economical. These conditions only apply, however, when the burners are giving their highest duty; and I regret to say that unfortunately the opposite conditions are far too often the case. In many instances the best possible burners are fixed, but with indifferent results. Gas, fortunately, is a good servant, and will burn under almost any conditions; but dust drawn into the burner, deposit from the products of combustion, and dirty globes all combine to handicap it from doing its best. Undoubtedly the remedy for this is maintenance. Much has been said on this question of late, but Glasgow has been the only undertaking to put it seriously into operation—that is to say, as a direct charge on the gas. The cost, I believe, is just over 1d. per 1000 c.ft. of gas sold, and the results are satisfactory. The latest figure for Glasgow maintenance is 0·529d. per 1000 c.ft.

Free maintenance must of necessity have its drawbacks, for the reason that anything free is always open to abuse. Again, the consumer who does not use gas for lighting purposes has to pay his proportion of the cost. Another scheme is to charge the consumer bare costs for services rendered, charge the materials used at market prices, and put any profit made into the scheme, and so cheapen it.

A stroll round the shopping centre of any town after lighting-up time will convince anyone of the necessity for maintenance in some form, as, generally speaking, the lights are in a deplorable condition.

A number of the slides, kindly lent by Messrs. W. Sugg & Co., of Westminster, were then thrown on the screen.

Discussion.

Mr. WILLIAMS (Chester) asked Mr. Payne if he would advocate the use of the flexible tube. Mr. PAYNE said he did not.

Mr. BRADBURY (Rochdale) asked whether the pepper-box nozzle was superior to the open type.

Mr. PAYNE said the pepper-box nozzle was largely used at Liverpool. It was their experience that a higher candlepower was obtained by breaking-up the gas and air mixture into a number of streams.

Mr. ROBERTS (Nelson) asked what was the duty of high-pressure gas.

Mr. PAYNE replied that in Liverpool they had obtained 60 c.p. per c.ft.

Mr. COOK (Warrington) asked for information on the cost of the gas switch.

Mr. PAYNE said that the cost of installing gas switches was reasonable. They had no difficulty in persuading customers to fit the pneumatic switch. The majority of people spoiled the working of the valve by applying oil to it.

THE OUTDOOR GAS SALESMAN.

By C. DICKENS, of Manchester.

Of the various forms of propaganda and publicity, all of which are indispensable to the salesman, there is no adequate substitute for the personal interview. I think it is now universally agreed that the gas salesman must be something more than a well-spoken and courteous individual equipped with a smart suit of clothes and a capacity for "telling the tale." My own experience is that what usually faces the salesman is not so much the all-important question of recommending the right apparatus, but the problem of installing the appliance (under what are very often adverse conditions) in a satisfactory manner, and with an eye upon the subsequent question of maintenance.

Manchester, in common with other undertakings, has always considered outdoor salesmanship to be a practical man's job. By this I mean that the salesman must be sufficiently experienced on the practical side to be able to instal efficiently an appliance he has recommended. It is obvious that, if the salesman is not competent in these respects, he may be creating future trouble for his undertaking, and may also be preparing a rod for his own back.

A method in operation in Manchester, while not being put forward as an ideal, has many advantages. The sales and maintenance departments are combined; and all apparatus installed automatically comes under the maintenance service. The outdoor salesmen (who are classified as district inspectors) are allotted districts, of which they are in complete control in their own particular branch. The duties include not only the selling of apparatus, but also the responsibility of maintenance. The district inspectors or salesmen are equipped with the necessary literature and application forms, &c., and are encouraged to promote sales. I think I am right when I say that nothing is more fatal to a prospective sale than to have to inform a consumer that he will have to call at the showrooms to make an advance payment, or sign a form, or that another individual will have to call to inspect and measure-up, &c. Under the Manchester system the whole of such preliminary work can be completed in the first instance on the job, and arrangements can be made to proceed with the work without further delay. Orders taken are made out in detail on triplicate forms, one of which is handed to the consumer. Upon his return to headquarters, the inspector draws up a complete specification of the materials required for the job, for the information of the fitter. During its progress the work is usually visited by the inspector, who is often at this stage (and also upon his final visit) able to pick up additional work. Upon the completion of the installation, the fitter returns his note, with full particulars of all materials and apparatus fixed, times, fares, &c., recorded on the back. This is carefully checked by the inspector on his final visit, when he tests the installation; and a maintenance card is then issued for periodical attention. Under this system the risks of misrepresentation and unsatisfactory workmanship are reduced to a minimum, and the percentage of disputed accounts is very small.

In circularizing for canvassing purposes, any literature is sent by post enclosed in a sealed envelope, with a covering letter drawing the consumer's attention to an impending visit from the maintenance inspector, who has been instructed to investigate and rectify any complaints, and explain the department's varied services. By this method the salesman gains an interview with a large majority of the consumers; and a number of complaints are usually brought to light. The patient investigation of an apparently frivolous complaint, and its subsequent correction, resulting in the bringing-back into more frequent use of any type of appliance, form, to my mind, a more valuable "sale" than the installation of a similar apparatus for a new consumer. When one calculates the large capital outlay on mains, services, meters, &c., and the standing charges for upkeep, the loss of a consumer, or even a reduced consumption, is a very serious matter; and while new business must be intensively cultivated at all times, it is my firm opinion that it would be a most unbusinesslike policy to neglect old consumers, and lay out further capital in creating new ones.

Many of us were no doubt interested, some little time ago, in an item in the Technical Press announcing a proposed scheme for the education of gas salesmen. I think the proposal was for the formation of a salesmen's course, candidates for which must first qualify by passing for a first-class certificate in Gas Supply, which would enable them to sit for a Diploma of Commerce.

To me the suggested scheme appears to be open to several criticisms. First, it is a well known fact that an expert technician is seldom a good salesman. Secondly, if the proposed Diploma of Commerce provides the degree of commercial knowledge that it should stand for, then there is no doubt that a recipient may find a more profitable avenue for his activities than in the gas industry. Third, I do not think the syllabus in Gas Supply provides for the practical side of gas salesmanship.

The alternatives I have to suggest are: That Gas Fitting be substituted for Gas Supply as a qualification to sit for the proposed Diploma, or, better still, that salesmanship be included in the syllabus of all gas subjects (both practical and theory), particularly in the earlier grades, and in this way, dovetail the technical and commercial sides of the industry. Those who are fortunate enough to be able to digest both lines of thought should then provide the industry with what may be an ideal type of outdoor gas salesman.

Southern District—Sub-Section "A."

April Meeting.

A Meeting of the Circle was held at the "Rendezvous" Restaurant, Woking, on April 6—Mr. F. A. Ricketts presiding.

COOKERS.

By A. W. Cullington, of the Woking District Gas Company.

The cooker is undoubtedly the appliance with the largest sale, and has truly come into its own. In fact, the great majority of housewives to-day look upon the gas cooker as a necessity. As a saver of labour it has no equal. The low price of gas as a cooking agent solves in no small way the financial problem of the housewife.

The cost is doubtless the deciding factor with the majority of people; and in this respect the gas cooker more than holds its own. An average electric cooker costs about 50 p.ct. more than any first-class gas cooker. The maintenance costs of the former are equally high. The elements are very fragile and susceptible to breakage by foods boiling over, &c. Costly in themselves, they are equally expensive to replace. Some electric cookers are now fitted with solid tops to the hotplate, so as to protect the elements. This reduces the efficiency. It is a recognized fact, even among electricians, that the contact type is much more efficient.

Mr. Cullington then dealt with the question of shrinkage of meat in the cooking process, pointing out that the argument often put forward by electricians to the effect that more shrinkage occurred when cooking was done by gas was unfounded. As to the cooker itself, continued the author, this must have a high thermal efficiency and must be hygienic and well constructed. Hospitals should be fitted with the open-type bars, to minimize loss of heat by conduction. Considering the matter of "smothering," Mr. Cullington said that this phenomenon was most noticeable with burners placed near the cornice, where the products were unable to escape freely from under the utensil.

Most flues are made to discharge their products horizontally, with the result that, when fixed near a wall, the latter becomes a trap for the escaping gases. Moreover, in such a position, it is an easy matter for a cloth to be inadvertently dropped over the outlet. In view of this all flues should be undercut.

Mr. Cullington prefers a cooker with 6-in. legs to one placed on a stand, and considers that it is false economy to sacrifice strength and good workmanship for low first cost.

The Chairman thanked the Woking Gas Company for their hospitality, and Mr. W. H. Eley, the Manager, responded.

A visit to the Company's showrooms terminated the meeting.

May Meeting.

A Meeting was held on May 4 at the showrooms of the Aldershot Gas, Water, and District Lighting Company, under the chairmanship of Mr. F. A. Ricketts, of Aldershot.

GAS SALES—LOOKING AHEAD.

By S. H. Wheble, of Aldershot.

We gas salesmen would do well to reflect for a short time on our future. We know our position to-day. Are we satisfied with the way things are going? No, I am sure we are not. I venture to suggest that every gas salesman—though he may be satisfied that his sales are improving—can but feel that now is the time for extra effort. He must obtain more business; he must look after those new dwellings while the opportunity presents itself; he must increase the consumption per service, &c. I am convinced that in the course of his daily round, he must realize that the next few years are going to be vital ones for the gas industry, because of the strength of the general competition we have to face. We must look ahead, and conduct our fight for business on the right lines.

There is a tremendous field before us for development, particularly in so far as heating is concerned, both for water heating and room-warming. Though all circumstances necessary for the obtaining of all domestic heating by gas are not likely to be brought about immediately, we can undoubtedly look forward to doubling our output in this direction in the near future. Cooking by gas, too, must be developed, and lighting must be retained.

We must bear in mind that our competitors are doing their utmost to capture the business we now hold, and to step in where we have failed. It is a big mistake to under-rate their power, but it is also a big mistake to let them see that we realize the strength of the opposition. The realization of the power of our opponents must be smothered by our enthusiasm; and we must go "all out" to win at every turn. We have to consider the following:

Oil, having largely lost lighting to gas, turned to cooking, and is now making a big effort to recover lost ground in the lighting world with its new incandescent mantle light.

Coal has lost cooking, intermittent heating, and water heating to a varying extent, but is still very popular with a large percentage of householders.

The strongest challenge, however, comes from electricity; and it is this which we have to watch most carefully. It has gained much ground for lighting and power, and is challenging cooking and heating. With this commodity it is all a question of cost, which at present militates against its use.

One of the greatest assets electricity has is the vast amount of support which it derives from a large percentage of the big daily newspapers. I think it is generally agreed that there is but little difference in the cost of gas or electricity if the supply is used for lighting only. Convenience may throw weight in the scales in favour of electricity, but I think gas weighs the scale down with a big thud in its favour when it comes to the question of which is the better light. Incandescent gas-lighting with a modern burner stands supreme as an illuminant. Figures prove that, for cooking and heating, electricity is so much more costly than gas that it is impossible at present for gas to receive any very serious challenge, though it is well known to us all that every effort is being made by the electrical industry with a view to securing a good place in these fields.

Regarding competition in the future, I would like to bring to your notice a few facts on the subject of coal conservation, based on a report to the President of the Institution of Gas Engineers by a Committee consisting of Sir Dugald Clerk, and Profs. Smithells and Cobb.

1. Of the whole of the heat expended on the carbonization of coal, if debited to gas produced, 45 of every 100 units are conveyed to the consumer.
2. Regarding electric stations (year 1919), of every 100 units expended by combustion of coal for generation of electricity, 7·6 units are available for the consumer.
3. For the best gas and electricity undertaking, the figures were: Gas, 53 units of every 100 delivered to consumer; electricity, 12 units of every 100 delivered to consumer.
4. It was anticipated that, if electricity was supplied by super-stations, approximately 18 out of every 100 units would reach the consumer, whereas, with improved practice of coal carbonization, gas would deliver 75 units out of every 100 to the consumer.
5. For heating, excepting temperatures over 1700° C., gas is by far the more economical fuel.
6. For lighting and power production, a comparison of the thermal efficiency of fuel consumption in the case of gas and electricity does not give the dominating claim to either.

Finally, it was strongly urged that maintenance and development of the gas industry is essential in the interests of fuel conservation, if for no other consideration. Surely these are figures and facts full of hope to the gas salesman, even though it is known that electricity can be generated by other means than by the use of coal. The erection of super-stations for the generation of electricity undoubtedly finds support from several aspects; but I venture to suggest that the distribution of supply to the consumer is going to be very costly.

The first aim of every gas salesman should be to get every possible piece of apparatus into dwellings already supplied, to increase the consumption per service. Now is the time to investigate every house, in particular for heating and cooking. It is far easier to turn the weakest competitor out, and become firmly established, than it is to "get in" against strong opposition. Moreover, it is going to weaken the strength of the strong competitor. We all know the difficulty of persuading anyone to scrap (say) an oil stove for a gas cooker which would render them a more satisfactory service. It is a more difficult proposition than offering a gas stove to replace a trying coal range. We must be first in the field, if we wish to reap the maximum amount of success. Every effort should be made to get mains laid in every district where there is a possibility of development, even though at present there is only a small return. I see that these next few years mean almost everything to us, if we, as we undoubtedly do, want to lead in the fuel field.

We must use every effort to put before architects and builders the advantages to be derived from the use of gas. The provision of gas flues to replace chimney breasts is one of the chief items we should press.

All consumers cannot afford to pay cash down, or even hire-purchase terms, for the necessary apparatus. I therefore suggest that, during the next few years, gas companies should supply and fix all types of gas appliances on low quarterly rentals—looking to the revenue derived from additional gas consumption to cover the purchase of the apparatus. Obviously, we shall all do our utmost at all times to obtain payment for apparatus installed, as we realize that the heavier the charges the company has to bear, the higher will be the price of gas. However, it is increased consumption that is most essential to bring about a reduction in price, so that it will obviously be in the best interests of every company to incur some little expenditure, in the provision of mains and apparatus, with this end in view. The appliances employed must, of course, be the most efficient type obtainable; and we must see that every consumer is rendered the best possible service.

Sales and service go hand in hand; and we must bear in mind that it is the gas salesman's duty to see that complaints are promptly attented to, and that apparatus purchased or hired is promptly fixed. One of the greatest assets any undertaking can have is a mass of contented consumers. In this connection it is essential for the sales and distribution departments to work

together. Our organization must be so perfect that every cog in the machine for supplying gas and apparatus to our consumers runs smoothly.

It is essential for our future success that showrooms be provided in which the working of all types of gas apparatus generally in use on the district can be properly demonstrated. Another important matter is that of the education of the consumer. We shall derive much assistance in building-up future sales by educating schoolgirls of to-day in the use of all domestic apparatus; and every opportunity of installing suitable apparatus in school cookery centres, &c., must be taken. The older schoolgirls of to-day will be the young housewives of the time when we shall probably find the strongest competition. If these girls are on our side, we shall find it easier to win through.

Now is the time to lay the sound foundation; and the building-up must proceed with the utmost speed, to enable gas to maintain the lead.

Votes of thanks were passed to Mr. Wheble for his paper, and to the Aldershot Gas, Water, and District Lighting Company for arranging for the meeting.

Midlands Circle.

A Meeting of the Circle was held at the Chamber of Commerce, Birmingham, on May 13—Mr. G. M. LEWIS in the chair.

PUBLICITY AND PROGRESS.

By W. T. PURCELL, of Stoke-on-Trent.

In the commercial world it is agreed that publicity and progress go hand in hand; and it is a fact that many firms who sell well-known commodities depend on publicity for their existence.

In the gas industry the showroom is a constant publicity agent, never resting on the merit of past achievement, but constantly striving to obtain further business. The first duty of the showroom is to demonstrate to the public what gas will do; and to an active and progressive undertaking a showroom is indispensable.

The service rendered by the gas industry affects the health, convenience, and comfort of all classes; but there are still thousands of people prevented, by ignorance alone, from deriving real benefits from the use of gas. It is an obligation of the undertaking, and a duty of the showroom, to enlighten the public on this vital subject; and to indicate by practical demonstration and suggestion what gas will do.

The showroom must be situated in or near the shopping area of the town; for the buying public will not go down a side-street or to a stores at the gas-works to make their purchases.

Apart from the steady improvement in the efficiency of gas lighting during the past few years, there has been a marked improvement in design and convenience. It is now possible to control gas lights from a distance by means of a pneumatic switch and special control cocks. Examples of these appliances should be fitted in every showroom; for this type of contrivance catches the eye of customers, and causes them to talk of the showroom to their friends afterwards. Then consider the effect of flooding-on half-a-dozen outside lamps when the daylight is failing, just by turning one cock. This convenience is still unknown to many people. Examples of concealed lighting also cause interest, and demonstrate the modern idea of "light on the object and not in the eye."

To encourage the public to talk is the root of all publicity work. Given a nicely-arranged showroom in a good part of the town, it would be futile to sit down and wait for orders to come along. The man in charge is a very important factor in the success of the scheme. He has to obtain the confidence of the public, and show them that the department are out to render service. He has to instil into the public that the whole knowledge, experience, and resources of his undertaking are available for their convenience, and that any service required, whether large or small, usual or unusual, will be rendered with absolute thoroughness. Above all he must be honest in his statements, even when it means the loss of an order, and he must fulfil all promises. The public are quick to notice when they are being treated in a straightforward manner, and they will come again, and perhaps send others. It is desirable to encourage people in these repeat visits to the showroom, and to encourage them to call in when they have a few moments to spare, whether they want anything or not. People entering a showroom should be allowed to walk round unmolested. Of course, a salesman can easily see when he is needed, and must be near at hand, ready to attend at the right moment. In some of the largest retail emporia in the world, prospective customers may walk from end to end of the premises without being asked what they require. In some quarters it is believed that this fact alone is responsible to a great extent for the progress of the concerns.

This "shop" effect needs to be encouraged, as the public are quite familiar with ordinary shops, and will walk round, perfectly at ease. But ask them to go into a "town-hall" type of building, and they at once loose their confidence, and become uneasy. Some showrooms are combined with the general offices; and, in the case of a lady requiring some small item—say, an odd mantle—she hesitates before facing the glances of an array of masculine officials, and gets the mantle from a small shop round the corner. The sale of this odd mantle is worth looking after; and the transaction should be carried through with as much importance as a twenty-pound order. Then the customer goes away pleased with the showroom, pleased with herself at commanding such respectful attention, and pleased with the article, for it is, of course, the best of its kind. The most important point is that she will in all probability come back again. Then perhaps the salesman may venture a "sale by introduction."

It is a good plan for a showroom attendant to try to forget that he is an official. He is a salesman or commercial man. The man in charge of the showroom should endeavour to obtain the confidence of builders, architects, &c. The medical profession, too, is very important to the gas industry; and all doctors should be catered for with extreme care, especially as regards heating. The gas fire is being used more and more for the sick-room; and very often the doctor has the casting vote as between gas and coal. To get the doctor on the side of the gas industry, it is obvious that he must first be satisfied with his own appliances; and trouble must not be considered in achieving this end. All appliances should be fixed with care, and special attention should be given to the supply pipes, so that each stove fixed may become a silent publicity agent.

Press advertisement, of course, enters into a publicity campaign, but this type of advertisement is rather expensive, as one insertion in a local paper will not have the desired effect, and it needs a series to make any impression. A gas exhibition is often a successful publicity agent. A well-organized and skilfully-arranged exhibition of gas appliances attracts an enormous mass of the public; and the results are felt for months afterwards.

The following actual facts will show the astonishing results obtained from this class of publicity. A few years ago a Midland gas undertaking decided to attempt a hire-purchase scheme for cookers. The necessary forms and books were prepared, and the showroom staff were posted with all information. In the course of twelve months or so, about two dozen cookers were put out on hire-purchase, and the scheme died unnoticed. A year or two afterwards the same undertaking decided to launch the scheme again. This time an exhibition of gas appliances was organized to inaugurate the scheme. Within nine months 2000 cookers were installed. Considerable business was done with simple hire and cash orders. Engines were fixed during this period taking an annual consumption of over 3,000,000 c.ft.

Plenty of leaflets should be distributed by the showroom staff. Every parcel of fittings, mantles, &c., should contain some form of advertising literature. Another suggestion as an aid to publicity is to set a window with some moving object.

To obtain the right atmosphere for the success of the publicity department, complete harmony must exist between all members of the showroom and fitting staffs.

Discussion.

The CHAIRMAN, opening the discussion, read a letter from Mr. F. Caudwell (Shrewsbury), in which he suggested that the word "education" should be stressed, rather than "publicity." It was of great importance to educate the consumer; and publicity did not invariably do this.

Mr. R. J. ROGERS (Birmingham) said that all true advertising was an educative force. He believed that it would pay an undertaking to hire a hoarding, and keep it filled all the year round with ever-changing poster appeals. Every form of publicity had its place and value, whether it was advertisement in local magazines, on gas accounts, or in newspapers. Education of the public had to be undertaken in a more subtle way. Some gas undertakings still thought it unnecessary to advertise. As long as this view existed the salesman's circles must keep hammering away to eradicate it. He emphasized the need for keeping all promises, and agreed that customers should be at liberty to stroll round the showroom. It was essential, however, that salesmen should realize immediately when they were needed. It might be well for the Circle to consider various methods of window dressing and display. He suggested that schemes for successful window displays might be sent in by members for criticism and consideration at some future meeting. In this way a valuable interchange of ideas might be effected.

Mr. G. BURDEN (Redditch) said that he had gathered many useful hints from Mr. Elson's paper which was published in the "SALESMAN" for April 29, p. 85. The literature supplied by manufacturers of apparatus, over-printed with local terms, was an effective form of advertisement

Mr. H. J. ANDREWS (Langley Mill) suggested that, in spite of all that had been said and written, some undertakings did not take sufficient trouble to assure themselves that the goods in their showrooms were really sound. With regard to local exhibitions, he advocated a "private view" by invitation, and the provision of afternoon tea. This he had tried, and found it a capital business-getting proposition. It also served to give the exhibition an excellent start. He had also adopted the policy of supplying apparatus on approval, and had found that less than 5 p.ct. was returned. This could be advantageously applied to the sale of gas irons.

Mr. C. W. WELFORD (Cheltenham) remarked that intermittent advertising was useless.

Mr. A. F. NEWBROOK (Stafford) said that his undertaking advertised gas apparatus on delivery lorries, telephone guides, local magazines, programmes, &c.; but local Press adver-

tisements had proved most successful. They regarded correspondence seals as an excellent form of publicity.

Mr. W. WILSON (Leamington) mentioned that his undertaking placed boards on all unoccupied property where they were making alterations or fixing apparatus. People always glanced at houses where workmen were engaged, and they therefore got a little free publicity. He asked if anyone had any literature relating to tumbler switch lighting, and would be pleased to hear of any advertising schemes carried out in the lighting field.

Mr. A. B. JONES (Derby) suggested that the personal touch was of greater importance in order-getting than any other form of publicity.

The HON. SECRETARY (Mr. W. L. S. Spinks) suggested that the title of Mr. Purcell's paper should have been "Service and Progress." He thought they would all agree that even pressures, good-quality gas at a reasonable price, the employment of skilled fitters, schemes of maintenance, and hire-purchase were among the essentials to progress. They could not, however, be termed publicity; they constituted service. The term publicity should be restricted to mean advertisement without reasoning. A certain amount of this type of publicity was necessary; but it covered less than half the field covered by the written and pictorial appeal. The poster, he thought, was one of the best and cheapest forms of publicity. They should fill advertisement space with "reason-why" advertisements.

Mr. PURCELL replied to the points raised during the discussion.

A vote of thanks, proposed by Mr. C. W. WELFORD, and seconded by Mr. P. F. COOMBES, terminated the meeting.

Scottish Circle.

THE GAS SALESMAN'S ATTITUDE TO ADVERTISING.

By W. M. MASON, Manager of the "B.C.G.A."

USEFUL EDUCATION.

I have chosen a subject which, though under continual study by those specially connected with publicity, demands the earnest consideration of business men generally. Those of us who particularly deal with the selling side of our industry should be clear in our own minds about the underlying principles and possibilities of good advertising as a means for boosting our own wares. Some of you may think you have enough to do without bothering with the things that the "B.C.G.A." is supposed to look after; but may I suggest that not only will the study of the principles and practice of advertising generally prove fascinating, but that the education and knowledge thereby gained will almost certainly prove beneficial to the salesman who devotes time to it.

One of the most encouraging things which I personally come across in my journeys throughout the country is the steadily increasing number of men (not necessarily the chiefs, on whom heavy duties and responsibilities associated with control and policy generally fall) who are as keen as if they were advertising agents on testing and trying-out their ideas and schemes in local publicity. The "B.C.G.A." is a national "pool" to which many of these men regularly contribute for the good of the whole, and from which they are glad to draw when occasion demands.

A WONDERFUL PROGRAMME.

We in the gas industry have such a fine story to tell—the story of national weal in coal conservation and the production of raw materials essential to industry, of communal well-being in supplying the most practical solution to the smoke problem, as well as increasing individual comfort and lightening labour in the home and workshop—that we may well be excused for waxing enthusiastic about it. The more we think and talk about our programme, the keener we shall become in spreading the story not in any spirit of "doing" the public for our own betterment, but only, and in every sense, in the public interest. It is just here that the great lever of advertising comes in. Even a Cabinet Minister is limited in his personal appeal; but, through the medium of the Press, and by the distribution of attractive literature, we can touch every home in our district, and nationally—if only we had the necessary wherewithal—every household in the land. One of the greatest possible sources of satisfaction to a right-thinking man is the happy fact that our business synchronizes with the public good.

I do not propose to give you a lecture on advertising in general—that is a proposition which even a World Conference such as was held at Wembley last year could not hope adequately to cover. I shall only endeavour, as I have said, to induce you to study seriously this great and fascinating subject for yourselves. Some of the points made at the Convention just referred to are worth repeating as concise statements indicating the place publicity holds in modern affairs. For instance:

ADVERTISING AS "CINDERELLA."

"Advertising is an essential art that conceals nothing. Its purpose is its power; and its purpose is to bring together the producer and the consumer for their mutual advantage in every market-place of which the toll gates are open or even half-open. It dresses the shop window for the inspection of mankind, and it attunes and harmonizes the seller's wares to the buyer's wishes."

"Economists have taught us in the past that there are three processes in business—production, distribution, and exchange—but an up-to-date economist to-day would certainly have to add advertisement."

It is a matter of more than passing interest that advertising, which has so often been looked upon as the "Cinderella" of business, is now regarded as a potent agent by means of which the trade of the world may be re-established. Art, Literature, and Science have all come into the service of this "Cinderella," who is coming to be regarded as the fairy princess, courted by the princes of commerce. Even a casual study of the advertisments in such a paper as "Punch" will speedily let you know "who's who" in big public business. The poster hoardings have been well named the art galleries of the poor.

Recently I read an interesting paper by Mr. Stuart Hirst, of Leeds, which contained many good things. Some of these I am going to pass on to you.

"A full realization of our dreams of trade supremacy hinges less upon improvements in, and labour saved on, production than it does upon a revolution, in many cases, of our ideas and methods of merchanting and salesmanship. In this country we are often better manufacturers than we are merchants."

GAS PUBLICITY FIGURES.

That is a statement applicable to the gas industry. The engineering or production end of the business has been, and is being, done admirably. The business development side is largely at the beginning. I do not for a moment suggest that there are not good business men in the industry. This would be foolish and untrue; but there are not many men as keenly alive to the investment value of modern service and publicity as there are to the essentials of (say) good engineering practice. Take the financial side of it. On the works a new installation of plant involving heavy capital outlay is, as a rule, undertaken i the engineer can demonstrate the need fo it; but how difficult, in many instances is it to get adequate expenditure for publicity and sales development. The Wembley Gas Exhibit Fund last year, and this is, we hope, an indication that many o our administrators are coming to appreciate the value of wise publicity; but ever in this connection many failed to respond to what is undoubtedly a splendid opportunity for useful propaganda.

After twelve years' specialized effort we are proud of the fact that over 90 p.ct. of the industry collectively contributes to the "B.C.G.A." something like £40,000 annually to be spent on advertising the service which gas can render the community and the nation. A generous estimate would perhaps double this sum as being spent directly in local publicity by gas undertakings and by manufacturers of appliances. In comparison with this figure, some individual business houses in London spend more. Figures recently quoted at a Salesmen's Circle gave the estimated revenue of the gas industry as approximately forty million pounds, and the total spent on publicity as £100,000, or only about 0·002 p.ct. of the income from gas alone. In this connection the following statement made at the Advertising Convention is significant:

ADVERTISING UTILITIES.

"The work of advertising the utilities of their service has hardly more than commenced. American public service corporations are now spending from one-quarter to one-third of one per cent. of their gross income for advertising and publicity. In other words, their annual expenditure for selling securities, building goodwill, &c., now amounts to something more than $12,000,000. In well-ordered private business the minimum expenditure for advertising amounts to about 2 p.ct., and the maximum runs as high as 8 p.ct. If the utilities were to spend as much as the minimum set aside by private business for advertising, their expenditure for this purpose would be $80,000,000."

In face of these figures of American expenditure, and in view of the fact that competition is rapidly increasing in strength and political backing, surely the time is ripe for greatly altered views on the whole subject. If the gas industry could be sold as a going concern to a big business man like the late Lord Leverhulme, for instance, and the wonderful "selling" possibilities from a national and communal point of view fully realized, would there not very speedily be inaugurated a popular "boom" for gas such as we have never even imagined?

It may be said that this is much more a matter for consideration by seniors and administrators than by salesmen. This is true, and action can only come from the top; but—and this is the main thing I wish to emphasize—salesmen can form their own intelligent opinions, and train themselves by study to take a thoughtful interest in this whole subject, and so be in a position to influence, whenever possible, a sane and right consideration of advertising as a great modern method of consolidating and developing business.

"Quality, price, and service are the cardinal virtues of successful trading, but the greatest of these is service;" and service must include the regularly-sustained education of the consumer. In ordinary business, a sale completes the transaction; with us a sale begins the job.

"The idea of service has to be conceived on big, generous lines, and applied sympathetically in every walk of commerce. Service not merely teaches us to help our customers in their reasonable, and sometimes unreasonable, demands. It teaches us to take, if we wish to prosper, their point of view in preference to our own, to produce the goods that please them first and ourselves last; and it teaches us that it is our

duty—our individual as well as our patriotic duty—to produce goods of the best sort, and always at the lowest marketable price. If we do less than this we are not worthy of an honourable place in the trade of a proud city and in the economic life of a great nation."

ADVERTISING AS A SELLING FORCE.

Concurrent with a changing of the old order of things, the producer is called upon not only to study more closely the wants of his customer, but to discover better and cheaper methods of satisfying these wants. More than any other important force in commercial life, advertising is often misunderstood, and as often again misapplied. It is by no means the specific for all our commercial ailments that some of its zealous advocates would have you believe. In the gas industry advertising will not make up for lack of service in other directions; it will only make the faults more glaring. Nor will the "B.C.G.A." national advertising do all that is required. Local and district advertising is essential to supplement the national. Several of the larger undertakings are now spending more in local publicity than their contributions to the "B.C.G.A." In one instance the amount is more than double, and runs into many thousands of pounds annually. One of the largest and most efficiently handled companies in the North of England actually spends six times more on local than on national advertising—*and it pays to do it.*

Advertising, rightly used at the right time and in the right place, is the most economical selling force in the world today. That is true whether you are concerned in the merchanting of goods or in the exploitation of a nation's cause. Advertising moulds national sentiment by the same motive power that it stimulates the public demand for Scotch tweeds or "Sunlight" soap. Propaganda and publicity are just different names for this same vital force.

ADVERTISING FROM THE RIGHT ANGLE.

The first thing that it is necessary to do is to view advertising from the correct angle. So many people who cannot see the wood for the trees have a very confused idea of its scope and appropriate uses. Think of advertising not as a mere adventitious aid, but purely and solely as a selling force in the business in which you happen to be engaged. Advertising does not raise the cost of goods to the public. In very many cases it actually succeeds in reducing the price, owing to improved and bigger production that follows the demand caused by the advertising. It is a frequent experience that advertised goods, besides being better, cost less than avowedly similar goods which are not advertised.

In gas administration it is surely a basic principle that, by spreading standing and capital charges over a bigger consumption, the price can be reduced to the consumer. Profits are made—or lost—in the board-room. It is a wise policy that brings continued success.

The four principal channels of publicity all bear the same initial. They are: The Press, the Poster, the Pamphlet or Catalogue, and the Personal appeal of the salesman or the mailed letter.

I shall not attempt to deal at length with these sections in detail; each is an interesting subject in itself.

VALUE OF THE PRESS.

The Press, under which classification, of course, I include the newspaper proper and almost countless magazines, owes its value as an advertising medium to the fact that it goes into the home (where the commercial traveller cannot hope to penetrate with his arguments). Our newspapers are read in moments of ease and leisure, and generally under conditions peculiarly favourable to the germination of new wants in the mind of the housewife or breadwinner. You cannot make a wisely-designed and properly-displayed appeal to 100,000 homes (or 10 million for that matter) through the medium of our daily newspapers without a reasonable expectation of creating some useful impression. The reality of the powerful advertising force that is being exerted almost unnoticed in our midst had recently a peculiar illustration, when all the newspapers in New York stopped publication, owing to a strike. Due to the absence of advertising, shopping business came automatically to a standstill. It is stated that, had the strike continued in full force for any length of time, there is little doubt that a disastrous blow would have been struck at the city's trade, and that many establishments would have been obliged to close-down.

From this illustration it is easy to conjecture what disturbance to our domestic and economic life would occur if suddenly, from any cause, the flow of advertising force—so silent, yet so mighty—was diverted or made to cease in this country. In all this it is to be remembered that what applies to business advertising generally, also, on principle, applies to gas.

Why should the utility business be any different from any other business when it comes to advertising? "Because it is a monopoly, and people have to come to it for service whether they wish it or not," say some supposedly intelligent people.

Advertising is accepted to-day as a necessary part of business, and advertising costs as a necessary part of the expense of doing business. In the utility business it not only helps to increase the consumption of the utility's product, thereby causing reduced rates through a wider distribution of the fixed costs of doing business, but it also is used to win the goodwill of the consumer. This last is surely an important method of keeping-down costs of service.

ADVERTISING PUBLIC UTILITIES.

The following resolutions passed at the Advertising Convention sum-up concisely the need for public utilities—including municipal and company gas undertakings—to advertise.

"That this Conference is of opinion:—

"(1) That it is as important to advertise the services which public utilities can render to the community as it is to advertise the goods of firms which have no monopoly rights of supply.

"(2) That goodwill, based upon equitable policy and 'service-first' principles, is essential to the permanent prosperity and persistent progress of public utility undertakings.

"(3) That advertising is esential to the establishment and maintenance of such goodwill.

"(4) That fully educated, efficient salesmen are equally essential.

"(5) That the possession of a monopoly, whether by a company or a municipality, imposes on its administrators the duty of a policy of progressive business methods, in the interests of consumers, as well as of stockholders or ratepayers."

The Editor of one of our technical papers was right when he recently wrote:

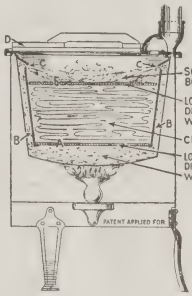
"Some people rely upon making the competence that is to care for them in their old age through the vagaries of chance; hence the lure of the oil stock promoter, the gold brick boys, and the backers of Monte Carlo. Most of the people, however, believe in the principle of working for the future through some well-planned system of saving and investing. To them the vagaries of Lady Luck possess no charm.

"Public Utilities can follow either of these paths. They can 'take a chance' and let the public form its own conclusions, or they can build for the future by some far-sighted plan. The gas industry is coming to a point where it is in direct competition with oil, coal, and electricity for the heating business of the country. A well-developed educational plan through consistent advertising will make the people realize the advantages of gas over other fuels, and will keep these advantages fresh in their minds at all times."

I have tried to avoid overloading this brief address with "indigestible" matter. My main object has been to stimulate interest in a subject the study of which is fascinating even as a hobby, but which, to the "live salesman," will prove a most profitable process in general culture and education.

A Gas-Heated Wash-Boiler.

Next in importance to the gas cooker and the fire, comes the gas-heated wash-boiler. This has long been appreciated in areas of dense population, where these appliances are used in vast numbers. The gas wash-boiler saves time, labour, and space, and is clean, thoroughly efficient, and economical.



Arden Hill's "Whirlpool" is an example of a boiler which will turn the most arduous wash-day into a day of comparative ease for the housewife. Fill the boiler with water, add soap; and the moment boiling point is reached, the imprisoned steam at the bottom of the pan forces the water up the tubes in the manner shown in the illustration. Emerging from the slotted heads of the tubes in a rapid and ample flow, the boiling water makes its way through a perforated top-plate, then through the clothes and the lower-plate, to be forced once more into circulation through the tubes. The hot soapy water is circulated through the clothes a number of times; the flow being equivalent to 200 gallons per hour.

The outer case of the "Whirlpool" boiler is made of strong durable galvanized iron. The inner pan is of tinned copper; and a combined flue carries-off the gas and steam products. A plate, pierced with a number of holes, slides down the inside of the pan, and rests at the ends of three circulating tubes, leaving a shallow chamber between it and the bottom of the pan. Little or no attention is required after the boiler has been filled with water, the clothes put in, and the gas turned on, for the circulating process takes place automatically when boiling-point is reached.

Literature illustrating and describing the "Whirlpool" and other gas-heated wash-boilers will be sent on application to Messrs. Arden Hill & Co., Acme Works, Salford Street, Aston, Birmingham.

Up-to-Date Cookery.

The other day we heard of a consumer being persuaded to replace his gas cooker by an electrical one. The electrical engineer who took the order accepted the gas cooker in part payment, and *had it installed in his own house.* The moral is that of ancient days: "Actions speak louder than words."—South Metropolitan Gas Company's "Co-Partnership Journal."

South Wales and Monmouthshire Circle.

A Meeting of the Circle was held on May 15 at the Gas Offices, Bute Terrace, Cardiff—Mr. DAVID MUIR, Engineer and Manager, Pontypridd, presiding.

The CHAIRMAN delivered the following

ADDRESS.

The question often occurs to me, Are the services of the salesman being utilized to the fullest degree for the sale of gas-works commodities, and do gas undertakings generally give sufficient assistance to equip the salesmen for the strenuous battle in which we are engaged to attain a purer and healthier atmosphere?

At the outset I would exonerate the larger undertakings who have well-trained salesmen in every branch; but a great many of the smaller undertakings, and even medium-sized ones, do not put sufficient impetus into the selling business. A gas salesman should not have his energies confined solely to the sale of gas appliances. He should be able to push the sales of coke, tar, sulphate of ammonia, and any other bye-products manufactured on a gas-works. The sale of ordinary gas appliances is on the whole pushed with considerable vigour. How many salesmen, however, try to sell some of the other useful commodities of a gas undertaking?

For example, the salesman, we will assume, has failed to sell a gas fire. Does he try to obtain business for his undertaking by informing the prospective customer that good heating service can be obtained from coke manufactured at the gas-works? If he has satisfied the customer with the appliance required, does he diplomatically turn his talk to the subject of gardening, which is of more than passing interest to most people? If he did, he would get an opportunity of discussing the benefits to be derived from the use of sulphate of ammonia. Tar could be talked about—for making pathways, and the preservation of fencing. Perhaps the customer is the owner of a motor car. Does the salesman grasp the opportunity of bringing to the customer's notice the use of benzole, which is manufactured in some gas-works? Perhaps the customer is keen on poultry rearing. Does the salesman impress on the customer the use of gas for his incubators and brooders, or creosote for the preservation of his poultry buildings, and for killing red mite?

Do undertakings always purchase the best fittings and appliances for the salesman to sell? I fear they do not. Undertakings generally do not make it a rule to test fully the appliances purchased, so as to obtain reliable data regarding consumption and efficiency. The result is that the salesman in a great many instances has to rely upon the information gleaned from catalogues. What is the result? A salesman sells an appliance based on these figures, and in practical working the results are not obtained. The customer is naturally displeased; and the seeds of displeasure are sown among his intimates, to the detriment of the gas undertaking.

Again, assuming that the salesman has sold a first-rate appliance, and has given correct information regarding its capabilities, does the undertaking always back-up the salesman by having a meter and service pipe put in of sufficient capacity to do the work required? Does the undertaking always take steps to ensure sufficient pressure throughout the district?

Does the average gas salesman have the opportunity of becoming conversant with the various bye-products for sale? No. This could be overcome by the technical staff co-operating with the sales staff, and educating them in this branch of gas-works practice. Greater facilities could be offered the salesman to obtain a more intimate knowledge of the work performed in the gas-works, thereby strengthening his hand.

Chiefs of gas undertakings should avail themselves of every opportunity to address meetings of Chambers of Trade, Rotary Clubs, and Trade and Labour Councils, &c., in order to prepare the ground for the salesmen.

If more attention was given to the failings enumerated in these random notes, greater service would be rendered by the gas industry to the community at large.

Immediately afterwards the Chairman called upon Mr. A. W. Stickler, Cardiff, to introduce for discussion:

RAMIFICATIONS OF DISTRICT WORK.

By A. W. STICKLER, of Cardiff.

The outdoor staff calls for highly skilled men who have had training in practically every branch of the gas industry, in order to enable them to deal thoroughly and competently with everything that may occur in the course of their duties. It is of the utmost importance that they be cheerful, courteous, good-natured, and prepared at all times to give good service to the consumer and their undertaking.

The opportunities afforded the meter inspectors for pointing out the advantages of gas and coke as smokeless fuels are numerous; and advantage should be taken of them. How easy it is for the meter inspector to distribute literature about various appliances. Inquiries could be followed up by the sales staff. Collectors, inspectors, estimators, and foreman fitters, should be in a position to give prices and terms of all gas apparatus their undertaking offers. This would obviate the necessity for a second call.

In Cardiff we are making a census of all gas appliances in use on the consumers' premises, and by doing so we are increasing the sale of gas. Briefly, the following is our procedure. A letter is sent to the consumer advising him that a representative will call to inspect the gas appliances in use, and offer advice regarding the economical use of gas. A call is subsequently made, and the registration of the meter is taken. At the same time the representative examines the service pipe, checks the size and number of the meter with a record card, and tests it for escapes and registration. He then inspects the appliances, carries out minor adjustments, if necessary, and points out where additional apparatus could be installed to the advantage of the consumer. On returning to the office, he hands-in a record card giving full particulars of the appliances in use, stating their condition and the prospect of new business, together with orders taken during the inspection. This record card is filed, and reference is made to it from time to time. Where there is any possibility of new business, periodic visits are made.

The "inspection canvass" has the following advantages:

1. The examination of the service pipe is a precaution against accidents.
2. Meter testing assists in reducing the unaccounted-for gas, and indicates whether the apparatus receives an adequate supply of gas.
3. Registration records constitute an intermediate reading.
4. Examination of consumers' appliances, minor adjustments, executed by the representative, and advice given, maintain the confidence of the consumer.
5. A record of appliances in use on the district indicates the possibilities of new business.

NEW BUILDINGS.

To further the sale of gas, progressive undertakings offer to builders services free up to a certain length, providing they lay a number of points of a specified size. Most builders take advantage of this concession; but the laying of points does not guarantee a consumption of gas. It is our duty to see that appliances are installed.

A consumer always wants his meter and cooker fixed before he occupies a new house. In nine cases out of ten, he will go into the showroom to give his order. Co-operation between the showroom and those engaged on the district is necessary. If the showrooms were supplied with a record of buildings in course of erection, with the particulars of the points laid in each house, and the most suitable appliances to instal, it would assist the showroom manager to increase his sales.

DISPUTED ACCOUNTS.

If a consumer is convinced that he has not consumed the amount of gas he is charged with, the following procedure may be adopted:

1. Ask the consumer if it is convenient for you to test the meter for escape.
2. Inspect the consumer's appliances, and point out where there is a possible waste of gas.
3. Take into consideration the number of days compared with the corresponding quarter.
4. Inquire if there has been illness in the house, and if additional apparatus has been installed, or any fittings have been repaired during the quarter in dispute.

CAPPED SERVICES.

A considerable amount of unaccounted-for gas can be traced to defective services. Therefore it is necessary to make a periodic inspection, especially of those that are capped, and not cut-off from the main. It is first necessary to keep a record of all such services, and their condition when inspected. Capped services are usually in unoccupied premises; and this makes an inspection more important, as it is possible for a slight escape to result in accumulation of gas in a cellar or building, which might lead to a serious disaster. From a recent inspection, it was found necessary to cut-off several old services from disused premises.

To give an adequate supply of gas to flats and suites of offices, there are many items to be taken into consideration—size of service, meter, internal pipes, &c.

Avoid fixing secondary meters. This practice is far too prevalent. Fix separate services in all premises where there is more than one consumer to be supplied.

Discussion.

Mr. C. KNIGHT (Cardiff) said that the practice of notifying showroom assistants of supply pipes, &c., being laid in new buildings was of great advantage.

Mr. C. COLLINS (Newport) mentioned the carcassing of new buildings. Instead of arranging with builders, it was better to see the prospective tenants, with a view to installing gas appliances.

The HON. SECRETARY (Mr. B. J. Bell, of Cardiff) said that in Cardiff they were offering certain concessions to builders, which were proving most satisfactory. A canvass of the district had proved a huge success. One good feature was the opportunity afforded of getting into personal touch with consumers.

Mr. H. S. BARTLETT (Cardiff) proposed, and Mr. BAILEY (Cardiff) seconded, a vote of thanks to Mr. Stickler for his paper.

The proceedings terminated by a vote of thanks, proposed by Mr. G. STEEL, to the Cardiff Gas Light and Coke Company for the accommodation placed at the Circle's disposal, and for the hospitality extended.

Truth in Salesmanship.

By Thos. Newton.

Truth in salesmanship is one of the many desirable qualities which all gas salesmen should possess. Every customer gives an honest deal; and in business, as in other walks of life, honesty is the best policy. The world's professional advertisers have so much regard for truth in their business that they have enshrined it in a slogan, "Truth in Advertising." This is reflected in the restrained advertisements of to-day as compared with the irresponsible advertisements and impossible claims of a bygone age. Advertising has not suffered as a consequence. Indeed, it has made, and is making, rapid progress. Adherence to the truth has directly promoted development, in which the choice of words, telling phrases, and apt quotations are blended together with obvious sincerity and candour.

Truth in advertising necessarily implies truth in salesmanship; and in the absence of advertising, truth in salesmanship should nevertheless prevail.

In connection with the sale of gas appliances, a sound knowledge of first principles is essential; and the gas salesman, having this knowledge at his disposal, not only need not fear the truth, but, on the contrary, should welcome it. He is in a particularly strong position when dealing with prospective customers—especially when he is thoroughly acquainted with the wares of his rivals. To tell the truth in these circumstances should be a delightful task; and the gas salesman will find that the pleasure is proportional to his knowledge of the subject. There can surely be no more deplorable state of affairs than a conscious or an unconscious deviation from the truth simply through lack of knowledge. Any false or misleading statement made will most assuredly "come home to roost."

It will therefore be seen that knowledge is a direct aid to truth in salesmanship, and particularly as far as the gas salesman is concerned. The moral, of course, is obvious. The gas salesman should not only have a general knowledge of his business—that surely should be regarded as the minimum—but he should also possess the knowledge of the specialist. For example, he should make himself thoroughly conversant with the special features and characteristics of the various gas appliances now on the market. A sound knowledge of these will enable him to give competent advice in a confident manner as to which appliance can be relied on to render the best service in given circumstances. It is also essential that the gas salesman should memorize the gas consumption, per hour, of each type of appliance he is called upon to handle; and a knowledge of efficiencies relating to gas appliances would make him more a master of his business than he would otherwise be.

Truth in salesmanship is specially desirable when stating the hourly rate of consumption of a given gas appliance to a prospective consumer. There should be no trifling with the truth in order to force a sale, since, apart altogether from ethical considerations, this is quite the wrong policy to adopt. A cleverly-engineered sale based on misrepresentation is little short of a calamity, the dire consequences of which will certainly be revealed a few weeks after the sale.

Whatever qualifications a salesman may possess, he may be classed as a failure if he omits to give satisfaction to his customers; and one of the surest ways of causing dissatisfaction is to understate or misrepresent rates of consumption. When once a customer's confidence is destroyed, the gas salesman, instead of being regarded as a trusted adviser, is treated with suspicion; and business suffers as a direct consequence.

Keenness and competence are commendable qualities in any gas salesman, but he who would excel in both qualities must possess a sound knowledge of his business. The possessor of the knowledge here referred to can fearlessly adopt as his motto "Truth in Salesmanship;" for no industry stands to gain more from the dissemination of the truth than does the gas industry. In this connection, competence may be said to beget truth; and for this, as well as for other reasons, it is greatly to be desired.

Truth in salesmanship is not merely confined to the spoken word, since impressions can readily be conveyed by looks and gestures. It is a mistake to do lip-service to truth, and at the same time to convey the opposite impression by every look and gesture.

How often, in other businesses, do we find inferior substitutes offered with plausible language and insinuating gestures which are apt to mislead the public into thinking that the substituted article is much superior to the one originally required? Yet the bare truth may be that the trader is temporarily out of stock of the original article; and rather than miss a sale he unblushingly resorts to subterfuge.

It frequently happens, of course, that what a customer asks for is not the article which is best suited for his or her particular requirements. In these circumstances, it is right and proper to point this out in a courteous and tactful manner, and then offer something calculated to give greater satisfaction. It would obviously be a great mistake to sell an article or appliance which is not suitable for a customer's particular requirements simply

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because he happened to be ignorant of that which would best serve the purpose.

Every customer is entitled to fair and candid treatment. If, therefore, a customer happens to err, through lack of knowledge, while stating his or her requirements, the least a gas salesman can do is to point out the error, fairly and candidly, yet as diplomatically as possible, in order to prevent the perpetuation of erroneous impressions. Nothing is so disastrous as the suppression of truth; and nothing is so difficult to rectify as false impressions when once these have become more or less established.

As regards the capabilities of various gas appliances now on the market, it is much better, and more satisfactory in the long run, to under-state than overstate possibilities. Care, however, should always be taken to render full justice on all occasions. Truth in salesmanship implies that, while, on the one hand, there should be no exaggeration or inflation of claim, on the other hand it is equally important that due emphasis should be laid on all the good points and qualities of the article or appliance under consideration. The good gas salesman, of course, would never dream of allowing anyone to depreciate the merits of an appliance which he was confidently recommending, and which he was thoroughly satisfied would fulfil the customer's requirements. In all his dealings, however, the salesman should take particular care that the promise does not exceed the performance.

Most gas undertakings, nowadays, have to compete with outsiders in the sale of fittings, burners, mantles, and all kinds of gas appliances; and it is really surprising what a lot of shoddy goods are being offered to the public by competing firms whose one and only object is to sell them, irrespective of whether or not they are likely to give satisfactory results. It is, of course, a commonplace that many complaints as to the quality of gas should more legitimately be levelled against these trashy and inferior fittings.

Here the gas salesman has a splendid opportunity to assert the truth, and at the same time to educate his prospective customer. Inferior fittings, burners, mantles, &c., may perhaps cost less initially; but invariably the running costs are higher, and the efficiencies lower, than they should be. What should be borne in mind is that the running costs and the efficiencies are remembered—being ever present—when the initial cost has long been forgotten.

A vigorous campaign based on truth in salesmanship would soon spell the doom of much of the trash; and in this campaign no person can play such an important part as can the gas salesman.

Hospital Economy Helps Smoke Abatement.—London could abolish its smoke pall, increase its sunshine, turn fog into mist and darkness into light, if it would follow the significant lead of its medical men and its hospitals, and use cleanly smokeless fuels. It is an interesting fact that the highest consumption of smokeless gaseous fuel per acre in any residential district is in the Harley Street area, which, as everyone knows, is occupied by our leading physicians and surgeons, and that to-day the great majority of the London hospitals (and especially those dealing with tuberculosis) are large consumers of gas for heating and other purposes. Some of them have two hundred or more gas-heating stoves within their walls. Westminster Hospital, which was recently enlarged and remodelled, has almost this number in use, as is shown in the current issue of the "B.C.G.A." "A Thousand-and-One Uses for Gas," which is illustrated by numerous views of its wards, kitchens, nurses' quarters, and so forth. Recognizing the continuous drudgery, dirt, and noise involved by the use of coal, the hospital authorities have almost completely eliminated it from the building, and in doing so have saved much valuable space that would otherwise have been required for storage purposes. Thus do economy and hygiene march hand in hand.

The Gas Boiler and Circulator.

A series of twelve papers prepared by Mr. FREDERICK W. DYE, and published by permission of Messrs. John Wright & Co. (Radiation Ltd., Proprietors).

PAPER XI.

THE EFFECTS OF HARD AND SOFT WATERS.

Broadly speaking, hard water is that which carries lime in solution, while soft water is deficient in lime. The quantity of lime is spoken of in "degrees of hardness"; each degree being a grain of lime per gallon of water. Hardness is of two kinds—permanent and temporary. The former does not cause a deposit of lime when the water is heated; the latter makes the familiar deposit of lime commonly spoken of as "fur," in kettles, boilers, and similar water heaters. The hot-water fitter need not concern himself with the permanent hardness, but only with the temporary. The local water company will state what the temporary hardness is.

Water is considered as soft when this does not exceed 8°. Liverpool may be taken as having a very soft water (from Lake Vyrnwy), the published hardness being 1·5°. London averages 16°, and is always called a "hard" water, though not excessively so. Water of 20° would be spoken of as very hard, while below 16° such terms as "moderately hard" downwards to "moderately soft" and "soft" would be used.

HARD WATER.

An advantage peculiar to hard water is that the rusting of iron and dissolving of zinc and lead do not readily occur. In London, great numbers of hot-water installations consist of plain iron boilers, plain iron pipes, and galvanized-iron storage tanks; and no discolouration of the water by rust occurs if the apparatus is put to use soon after its erection. If water is allowed to remain stagnant in the new pipes and parts for any length of time, rusting and discolouration are experienced, but even these disappear after a period of regular heating and use. The wise engineer, however, uses galvanized pipe, as he cannot always tell whether first conditions may not favour a little rusting, with complaint following. Galvanizing the pipe is sufficient protection until the hard water can have its own protective effect, which means the deposit of the first film of lime.

The accepted explanation is that the rusting of iron does not occur freely in the presence of lime. The success of reinforced concrete construction is some proof of this, as the iron reinforcement does not perish. The writer has also carried out many experiments showing conclusively that lime has this good effect, whether in the form of chalk, lime, or cement.

The disadvantage of hard water is that the lime deposited from it, when the water is heated, accumulates and hardens, forming an incrusted mass in the boiler—usually on the surface where the greatest heat is felt. This not only prevents the water having contact with the iron, but, being a poor conductor of heat, the metal presently becomes injured, much the same as if there were no water in the boiler to keep the metal at a low non-destructive temperature. In other words, the metal is caused to fracture or perish, which shows itself in the form of leakage. Apart from injury to the boiler, a loss of fuel (gas) occurs, owing to the lime resisting the passage of heat, by reason of its low heat-conducting quality. Recognized authorities have stated that an incrusted deposit of lime of no greater thickness than $\frac{1}{8}$ in. makes it necessary to burn 15 p.ct. more fuel for a given result.

The measure to be adopted with boilers in hard-water districts is to open and clean them at regular periods. The deposition of lime is in ratio to the hardness of the water, the number of times the water is changed in the boiler (that is, the quantity used), and the temperature to which the water is raised. It has been stated that lime is not deposited from hard water until it reaches a temperature of 150° Fahr., but in practice this is found to be incorrect. It is known from experience that the amount increases as the temperature rises; and, as gas boilers are fitted with thermostats to limit the temperature, the deposit of lime is limited also, which is highly desirable.

The chief cause of variation in the amount of lime in boilers (in a district which is served by only one water company) is the amount of fresh water heated and used—which is always an uncertain quantity. As a general rule, with water of London hardness, and its heat limited by a thermostat, and the boiler fitted in private residence of fair size, annual cleaning is sufficient. In small properties the time may be extended; while in business establishments, half-yearly, or even quarterly, cleaning may be found necessary. Reasonable judgment must be used; and the desirable plan, with all new boilers, is to book a date for first opening and cleaning, when the state of the boiler will be a guide for future regular attention.

NOTE.—The boilers supplied by Messrs. John Wright & Co. are treated internally with "Anti-scale," which prevents the lime adhering so firmly to the metal. It is not claimed that this treatment reduces the quantity of lime, but, by preventing its close adherence, cleaning is facilitated, while the metal is not so greatly affected by the heat. Regular cleaning is still as necessary, but is more easily and perfectly done.

SOFT WATER.

The chief advantage of soft water is in its being agreeable to use, and needing less soap for washing purposes. Its disadvantage (to the hot-water engineer) is that it attacks iron, zinc, and lead. Galvanizing the surface of iron pipes, &c., is no protection, for the zinc soon goes. There is a general belief that the action is worst when the water comes off moorland districts, which gives it a slightly acid quality. In all districts served with water of this kind, the use of iron must be avoided. In a number of such places iron boilers are used which have been treated by the Bower-Barff process, while in others it is the common rule to employ copper boilers, copper cylinders, copper or lead pipes, and slate cold-water cisterns. The action of this water on lead must be rather slight, as lead pipes are commonly installed, and last well; but the action is sufficient to make the water unsafe for drinking purposes.

When copper pipe is used, the practice is to have a quality which will allow of its being screwed iron thread, for which brass or gunmetal fittings can be obtained from plumbers' warehouses. If this quality entails too high a cost, a lighter pipe can be obtained, this being screwed with a finer thread. Certain makers of copper tube supply this pipe, loan the tools for screwing it, and supply suitable fittings.

A common experience is that copper pipes with screwed joints (using red and white lead and hemp, as with iron pipes) do not remain sound; and a number of engineers consider it necessary to "tin" the threads with solder before screwing up, and afterwards to apply the flame of a blow-lamp. There are several patented methods of jointing copper pipes without a screw thread, with which a light tube may be used (and will last well); but it is not within the province of this paper to describe them. They are advertised in trade journals.

When employing lead pipe, plumbers' wiped joints are the rule; and the impor-

nt point to remember, and guard ainst, is the liability of this pipe to ngthen and sag when used for hot ater. It has been suggested that lead pe expands to a certain extent when ated, but does not contract to the same tent when cooled. The fact, however, that, after expanding, if the pipe exriences any resistance in contracting, it liable to stretch, and so become gradually lengthened. The rule to be observed, erefore, is that lead pipes for hot water, hich are in a horizontal direction, shall ways rest on wood fillets if on a wall; on boards if in a roof; or shall be supported in this way, every inch, wherever ey may be run. When run in a vertical irection, the pipe should have lead tacks " soldered on to it, to allow of its sing secured to the wall in a permanent anner; for no kind of hook or holdast can ensure such even and sufficient pport.

FAULTS.

Only what be termed principal faults an be referred to. Unusual, or more bscure, failings are seldom encountered.

Faults which may be found in the hot ater apparatus already in the customer's ouse, and to which the circulator is to be onnected :

(1) *The Flow Pipe* from the range oiler to the upstairs tank may terminate oo low in the tank. This *must* be corected (see Paper IV.). It entails removing the lid of the tank, which is a roublesome task, but one which has to e done. With a storage cylinder downtairs, the pipes from the circulator should ot join the range pipes (see Paper VI.); onsequently the range pipes then need no consideration.

(2) *The Cold Water Supply Pipe* may e connected into the bottom plate of the ank or cylinder; and if it has no fitting ttached to it inside, the cold water will be delivered vertically and bore up to the top of the storage tank. (See Paper IV.) It is of importance that the cold water be delivered horizontally inside the bottom part of the tank, or cylinder, as described in Paper IV. This must be put right.

(3) The storage tank or cylinder may be larger than is needed, and too big for the boiler. It has been explained elsewhere that the storage should not exceed half-a-gallon to each cubic foot of gas burned at the boiler when burning full on. Thus, a burner having a maximum consumption of 80 c.ft. per hour will work well with a storage tank up to 40 gallons. If the storage is considered to be too great, as above stated, it can, if a downstairs cylinder, be given a less active capacity, as described in Paper VI. (fig. 19), or can be reduced generally, as Paper VII. (fig. 20).

(4) *Exposed Pipes.* — The circulating pipes in the house may be so long, and so exposed—the upstairs tank, too, possibly being in a cold place—that some fear may be felt that the heat losses will make the boiler appear to be of low efficiency, with the certainty of an excessive gas consumption for the duty performed. It is best to consider that everyone will complain at both these things; and preventive measures should be adopted at the beginning. The cost of heat losses in money figures, and the available means of preventing or reducing them, are fully set out in Paper X.; while in Paper V. is described the somewhat simple means of converting the upstairs tank to the downstairs cylinder system, with great advantage to the consumer, as well as to the boiler.

(5) *Secondary Circulations.*—In residences of fair to large size, with storage cylinder in the kitchen, there is often found a pipe circuit extending from the top of the cylinder to the various taps, and, as this has hottest water circulating through it at all times, and is hot from end to end, the heat loss (and gas consumption) may be as bad as described in the last " fault " (4). In a few instances the circuit may be found unnecessary, and the customer willing to have it stopped off. In others, some thought has to be given to covering the pipe, as described in Paper X., while a means of ending the night losses and retaining what hot water there is in the cylinder is described in Paper V., fig. 15.

Faults which may be discovered after the circulator is fixed :

(6) *Exceeding the Maximum Gas Consumption on the Makers' Card of Directions.*—This is unlikely to occur with a gas official, but he will find it a too common thing when following-up complaints. Excessive consumption defeats itself, usually by causing smothering, besides which the gas flames may be devoid of cones, and less effective. Ordinary pencil-shaped flames should have well-defined, sky-blue cones, and in all cases the burners should be adjusted not to exceed the makers' maximum. The common consumptions for two different sizes of boilers are 40 c.ft. and 80 c.ft. per hour respectively, which are equivalent to 2 c.ft. and 4 c.ft. in three minutes, which can be easily and quickly observed at the top dial of the gas meter, if no other gas is burning at the time. It is easy to fall into the error that a greater gas consumption will ensure an increase in the quantity or temperature of the water being heated, but it is an error when the makers' figures are exceeded.

(7) *Flue Troubles.*—It is too commonly thought, by those outside the gas industry, that any kind of flue, or even no flue, suffices for a gas boiler. The subject is fully treated in Paper VIII.

(8) *Time Taken in Heating Water.*—Many consumers take too sanguine a view

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of what a gas boiler will do—they think it resembles a geyser, and is another kind of instantaneous water heater. Where the great difference exists is in the rate of gas consumption. A circulator burns (full-on) 40 to 80 c.ft. per hour; the geyser (say) 120 to 200 c.ft. It follows that the geyser is about three times as quick; but the customer does not realize the great difference in the amount of gas burned in a given time. A small circulator is often well suited for a small house, but there may be a warm bath wanted before breakfast. The gas consumption (full-on) is 40 c.ft. per hour; therefore, it takes one hour for a bath, which is thought to be an unreasonable, perhaps an impossible, time to wait. In addition to the time taken, so many think the gas consumption is too great (because of the time taken), it having often been said: "We have to burn the gas for an hour to get a bath, and we are sure that it costs a shilling." The cost is possibly 2d., and the customer looks incredulous when told that the best, or the worst, that the boiler can do is to burn twopennyworth of gas per hour. This subject is included under "faults," as it is one that should be introduced to the customer and made clear, preferably before the purchase, after which it should not be regarded as a "fault."

Useful Information for Gasfitters.

A booklet compiled by the Consumers' Gas Company of Toronto, for the use of architects, builders, owners, plumbers, and gasfitters, contains much useful information. In this it is pointed out that town gas, when burned in appliances which are properly designed, constructed, and installed, is a most economical and safe fuel for domestic and industrial purposes. The fact that 75 p.ct. of all the complaints of poor gas service are found to be due to piping which is too small, or which has been improperly installed, should convince anyone that the public interest demands that those responsible for the building of future houses should see to it that the gas-piping system is properly designed and installed. Interesting figures are given of the remarkable growth of the gas industry in Canada and the United States. In 1901, the production of gas was 101 million c.ft. In 1924 the output amounted to 420 millions.

The following items are extracted from the piping instructions given in the booklet:

General Piping Instructions.

In all houses, flats, or apartments the gas line from the meter to the kitchen should not be less than $\frac{3}{4}$ in. in diameter.

Riser pipes should be installed wherever possible in an inside partition, and should never be less than $\frac{3}{4}$ in. in diameter.

Pipes should be so run as to drain towards the gas meter.

Sags or traps should in no case be permitted.

Never use a union in concealed work. Properly-designed long screws or right and left couplings are permitted, but must be carefully installed.

Cellar lines should be hung from the ceiling.

In calculating the size of run necessary to supply a number of appliances, where the actual amount of gas to be used per hour is known, consult Table 1, when appliances are located at, or near, the end of a line, and the rate of gas consumed per hour is fairly accurately known.

Where a system of piping is to be installed, Table 2 will be found useful.

Outlets for illumination should project not more than $\frac{7}{8}$ in., or less than $\frac{5}{8}$ in., from the finished wall, and should be firmly secured at right angles to the wall.

Drop outlets for illumination should project from $1\frac{1}{2}$ in. to 2 in. below an unfinished ceiling, and not less than $\frac{3}{4}$ in., or more than 1 in., below a finished ceiling.

Openings for kitchen appliances should extend 3 in. above the floor-level, and be 2 in. clear of finished baseboard.

In large buildings, where foundation walls are of unusual thickness, a way should be provided for service pipe to pass through walls when these are being built. The preferable way would be to build a sleeve of iron or terra-cotta pipe in the wall at the point where the service is to enter the building.

Riser pipes should always be installed and openings provided, so that in case a stoppage should occur, from any cause, the pipe can be easily cleared.

Meters shall not be set in small unventilated places.

Always use fittings in making turns, do not bend pipe.

When pipes pass through heavy masonry walls, they must be encased; the gas pipe resting on the bottom of the casing pipe, with a clearance of $\frac{1}{2}$ in. on top.

All tests will be made with an air pressure of 6 lbs. per sq. in. on a spring gauge or 12 in. of mercury on a mercury gauge.

Water Heaters.

A separate and independent line should always be installed to supply an instantaneous water heater having a capacity of more than 140 c.ft. per hour.

The size of a horizontal run to supply an instantaneous water heater should never be less than the size of the opening from the heater, and preferably should be one size larger.

Dampers should not be installed in any flue connection.

Gas Fires.

For one fire and one opening in kitchen not less than $\frac{3}{4}$ in. pipe should be used.

Three fires and one range may be taken off a 1-in. pipe.

When more than three fires are taken off a kitchen run, the minimum size must be $1\frac{1}{4}$ in. pipe.

Not more than one fire opening should be allowed off a $\frac{3}{4}$-in. pipe.

Openings for fireplace appliances must not project more than 1 in. above the finished bottom of the fireplace, and must not be run closer than 6 in. from either of the finished sides or back of the fireplace.

Table 2.—*Piping Size Requirements.*

(When gas is used chiefly for lighting and for small appliances using gas for fuel; when outlets are located at many points in the building; and when the total amount of gas to be used is not accurately known, or may be subject to future change.)

No. of $\frac{3}{8}$-in. Outlets.	Size of Pipe in Inches. $\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	4
	Length of Pipe in Feet.							
1	20	30						
2	27							
3	12							
4	50							
5	33							
6	21							
7	18	70						
8	13	50						
9	44							
10	35	100						
11	30	90						
12	25	75						
13	21	60	150					
14	18	53	130					
15	16	45	115					
16	14	41	100					
17	12	35	90					
18		32	80					
19		29	78					
20		27	65					
21		24	58					
22		22	53					
23		20	49	200				
24		18	45	190				
25		17	42	175				
30		12	30	120	300			
35			22	90	270			
40			17	70	210			
45			13	55	165	400		
50				45	135	330		
65				27	80	200		
75				20	60	150	600	
100					33	80	360	
125					22	50	230	
150					15	35	160	
175						28	120	
200						21	90	
250						14	59	
300							39	
350							29	
400							22	
500							14	

In using the above table, if an outlet is larger than $\frac{3}{8}$ in., it must be counted as more than one, in accordance with the schedule below:

Size of outlet in inches	$\frac{3}{8}$,	$\frac{1}{2}$,	$\frac{3}{4}$,	1,	$1\frac{1}{4}$,	$1\frac{1}{2}$,	2,	$2\frac{1}{2}$,	3,	4
Value of $\frac{3}{8}$-in. outlets	1,	2,	6,	11,	20,	32,	66,	115,	181,	372

Table 1.—*Piping Size Requirements.*

(When appliances are located at (or near) end of line, and rate of gas consumed is fairly accurately known.)

C.Ft per Hour.

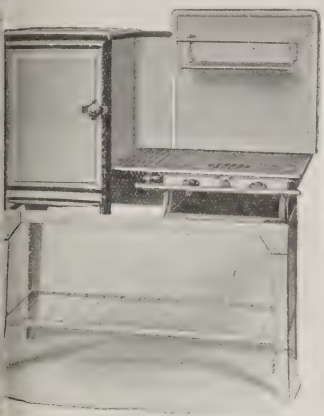
Piping Length. (Ft.)	Gas Consumption Allowable for Pipes of Nominal Diameter (Inches). $\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	4
10	35	70	200	400	700	1100	2300	4000	6400	13,000
20	25	50	140	300	500	800	1700	2900	4600	9,500
30	20	40	120	240	420	700	1300	2400	3700	7,800
40	15	35	100	200	360	600	1100	2000	3200	6,600
50	15	30	90	180	320	500	1000	1800	2900	6,000
60	15	30	80	170	300	460	1000	1700	2600	5,400
70	15	25	75	150	270	440	900	1500	2400	5,000
80	15	25	70	150	250	400	800	1400	2300	4,700
90	10	25	70	140	240	380	800	1400	2200	4,500
100	10	25	65	130	230	350	700	1300	2000	4,200
125	10	20	60	120	210	330	700	1200	1900	3,900
150	10	20	50	110	190	300	600	1100	1700	3,500
175	10	20	50	100	170	270	600	1000	1600	3,500
200	10	15	45	90	160	250	500	900	1400	3,000
250	10	15	40	80	140	230	460	800	1300	2,700
300	5	15	35	75	130	200	430	700	1200	2,400
350	5	10	35	70	120	190	390	700	1100	2,200
400	5	10	30	65	115	180	370	600	1000	2,100
450	5	10	30	60	100	170	350	600	1000	2,000
500	5	10	30	60	100	160	330	600	900	1,900

(Example: If the appliance consumes at the rate of 200 c.ft. per hour, and the length to be run is 100 ft., $1\frac{1}{2}$-in. pipe should be used, because 1-in. pipe, the next smaller size, will deliver only 130 c.ft. per hour.)

Association of Gas Salesmen (Northern Area).—Owing to the usual date of the meeting falling in Whit week this year, it has been arranged to hold the next gathering on Wednesday, June 10, at South Shields, by permission of the Management of the South Shields Gas Company. The following papers will be given: "Competition, Gas and Electricity," by Mr. T. J. Laycock (Tynemouth), and "A Few Remarks on Gas Appliances," by Mr. G. Lumley (Hull).

"Anti-Waste" Gas Cookers.

At No. 20, St. Paul's Churchyard, London, E.C. 4, Anti-Waste Appliances, Ltd., are exhibiting their cookers, radiators, water heaters, and what they term "combination sets," which comprise a kitchen range, gas stove, and hot-water supply. On entering the firm's showroom, one is impressed at once with the remarkably clean and well-finished ap-



An "Anti-Waste" Cooker—One of the Latest Designs.

pearance of the appliances. The main parts are finished in white enamel, and only require a cloth to keep them clean. Fittings are heavily nickel-plated, and these also only need occasional rubbing with a dry cloth or leather. The accompanying illustration serves to indicate the general appearance of these cookers better than a long description could.

Novel Features.

"Anti-Waste" cookers are fitted with a novel type of burner. There are two rates of gas supply at each tap, each having its own air supply, which can be regulated easily. The grilling burner consists of a straight cast-iron tube formed with a flat bottom portion provided with two rows of gas ports on each side. The tube can be rotated so that the flat portion faces upwards, thus converting it into a boiling burner. The oven is made of pressed sheet-steel, and the hotplate is provided with circular plates so that one can have a solid or open top at will. Other small and novel conveniences add to the selling power and flexibility of the cooker.

Result of an Exhaustive Test.

Some little time ago an "Anti-Waste" cooker was submitted to the Good Housekeeping Institute, of No. 49, Wellington Street, Strand, W.C. 2, for a thorough investigation. The cooker was used for the routine cooking of the Institute for four months; the work including baking of large rich fruit cakes, bread, biscuits, pastry of all kinds, and boiling, roasting, frying, and grilling, with highly satisfactory results.

The hotplate, state the Institute, is easy to keep clean, and saucepans do not tip-up. The discs for covering the boiling burners effect great economy, as two round or four square saucepans can be kept at boiling-point over one ring. The three-way turn of the gas-cocks is a convenience, as a steady simmering or boiling heat can be maintained.

The consumption of the burners, at a gas pressure of 2·6 in., is as follows:

Boiling burners, full on	20·4 c.ft.	per hour
Boiling burners, simmering flame	2·4	,, ,,
Griller	18·8	,, ,,
Oven	26·8	,, ,,

The efficiency of the boiling burners was found to range from 30 p.ct. to 41 p.ct., according to the speed of raising water to boiling-point. The former figure was obtained when one quart of water was raised from 62° to 211° Fahr. in 9½ minutes; the latter figure when the time taken for the same operation was 15 minutes.

The following specific tests were among those carried out:

Lunch cooked for ten persons, consisting of: Shepherds pie, roast beef, boiled potatoes, grilled tomatoes, steamed ginger pudding, Swiss roll, 3 doz. cherry cakes, and 2 doz. coconut pyramids.

Time alight	3 hours.
Temperature of oven in 20 minutes	440° Fahr.
Gas consumed	71 c.ft.
Cost at 3s. 7d. per 1000 c.ft.	3d. approximately.

Lunch cooked for twelve persons, consisting of: Roast pork, baked potatoes, greens, and trifle.

Time alight	2½ hours.
Gas consumed	72 c.ft.
Cost at 3s. 7d. per 1000 c.ft.	3d. approximately.

Lunch cooked for twelve persons, consisting of: Two meat pies, greens, potatoes, 4 doz. "Maids of Honour," and a large Madeira cake.

Time alight	2½ hours.
Gas consumed	85 c.ft.
Cost at 3s. 7d. per 1000 c.ft.	3½d. approximately.

Lunch cooked for twelve persons, consisting of: Roast beef, Yorkshire pudding, greens, baked potatoes, stewed rhubarb, custard, and two Swiss rolls.

Time alight	2 hours.
Gas consumed.	58 c.ft.
Temperature of oven in 20 minutes	440° Fahr.
Average temperature.	320° Fahr.
Cost at 3s. 7d. per 1000 c.ft.	2½d. approximately.

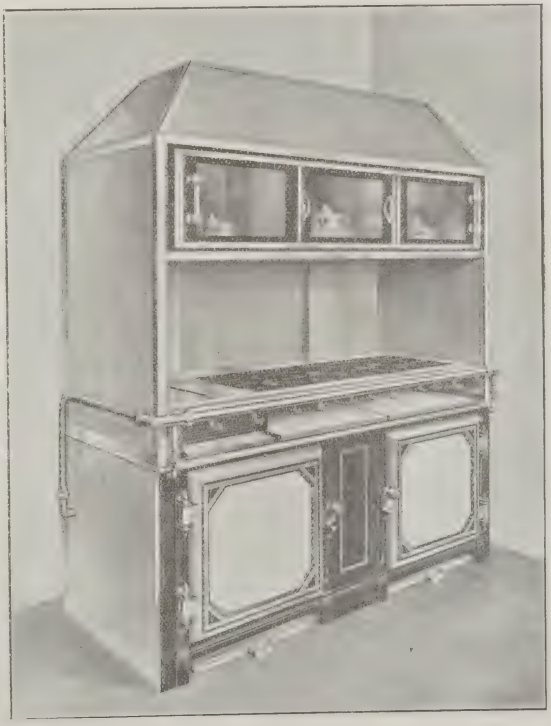
Gas Cooking in Large Mansions.

Even in such a prosaic sphere as the manufacture of gas cooking appliances, the rare gift of imagination is an asset. The owner of a large mansion near Hyde Park began to look round for a super cooking range worthy of being installed in his house. He was also the possessor of ideals which he did not disdain to apply to the equipment of his kitchen; and it was left to one of the Radiation firms, by means of enterprise and foresight, to turn his "vision" into the reality of an order, which resulted in the production of a gas cooking range worthy of the name bestowed upon it by its makers—the "Mansion" range.

This range, which is illustrated here, is made by Fletcher, Russell & Co., Ltd., and is an ideal cooker for the purpose for which it was designed. A short description may be of interest.

It is a double oven range, each oven being 24 in. wide by 24 in. deep inside, the hotplate being fitted with a grill and nine boiling burners of the "high-efficiency" pattern, with gas and air adjusters. The range has enamelled linings, enamelled trays under the hotplate, and enamelled panels in the oven doors. The whole of the range is highly finished, with all bright parts nickel-plated. A special canopy constructed of stout aluminium, and having sliding doors provided with plate glass panels, and highly polished inside and out, is fitted over the range, and encloses the hotplate. Special vent space is provided behind the hot closet, to prevent the entry of cooking vapours.

It may be stated that it is only in very special cases, such as the one just mentioned, that these superfine finishes are

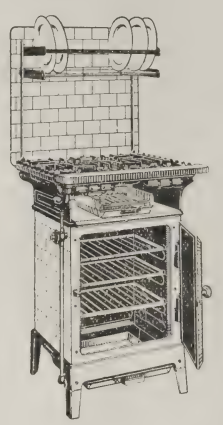


brought into use, as the efficiency and utility of a range are, of course, in no way dependent on high-class finish.

The kitchen in the mansion referred to is tiled in white-glazed tiles from floor to ceiling, and in addition to the range, all other appliances such as utensils, ice safes, china cabinets, sinks, water taps, &c., are in keeping. The addition of a highly-finished gas range completes an ideal kitchen.

Correction.—In Table V. in last month's instalment of "An Elementary Treatise on Gas Lighting," a slight error crept in. In item 3, sections *c*, *d* and *e*, B.Th.U. per candle-power-hour are on the basis of *mean hemispherical candle power*, the accepted abbreviation of which is m.h.s.c.p. The same, also, applies to source 5. The abbreviation m.h.c.p. in regard to these sources is incorrect. M.h.c.p. is the abbreviation for *mean horizontal candle power;* whereas the figures for inverted gas mantles and the petrol air-gas incandescent burners have been based on *mean hemispherical candle power*. The duty of the electric sources, except where otherwise stated, have been given in terms of mean horizontal candle power; and here the abbreviation m.h.c.p. is correct.

Window Display Technique.—Discussing the subject of window display technique as applied to the gas industry, Mr. E. T. M'Spadden, of the Public Service Company of Colorado, says, in the "Gas Age-Record," that everyone is artistically inclined to a certain extent; and therefore in presenting something beautiful one draws the interest of all who see it. The background itself of the window display should be one of two extremes. It should be very simple or very elaborate. The very simple is the better of the two, giving the appliance shown—he is referring particularly to the featuring of a single all-enamel gas range—every possible opportunity to speak for itself. In no other display does the placing of a floral piece or drapery to good advantage mean so much. The reading matter used in the window is worthy, too, of careful consideration. The public has had to endure for years the lengthy tale unfolded on cardboard, and for years has glanced at it and passed on. Why not try a short and to-the-point message in a dozen words?



Gas Salesmen are specially invited to send for the booklet describing the Radiation "NewWorld" Cooker.

Its automatic oven-heat control device is the most highly praised development in the Gas Industry since the Incandescent Lighting Mantle was produced.

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The WHOLESALE FITTINGS CO., Ltd.,
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See Advert. p. 413 of "JOURNAL," May 13.

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CLARK'S SYPHON STOVE CO., LTD., 164-172, Queen Victoria St., London, E.C. 4.

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The Gas Salesman and Gas Service.

VOL. 4, NO. 42.]

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APPOINTMENTS & PROMOTIONS.

Gas Salesmen, Showroom Attendants, and Manufacturers' Representatives are invited to send information as to promotion or changes in appointment for publication under this heading.

NOTICES.

Copies of this Supplement for Distribution among Members of the Gas Sales Staff, can be obtained at the office of the "Journal." Price per 100, 35s.; 50, 18s.; per doz. 4s. 6d.—plus postage; single copies, 5d. (stamps for single copies with order).

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EDITORIAL.

Cost of Inspection and Maintenance.

It is pleasing to note that systems of inspection and maintenance of consumers' appliances are being adopted in many places, and are giving satisfaction wherever applied. Where applied, that old complaint of "bad gas" is being forgotten; and people are learning that with the local gas good results can be obtained, if their appliances are kept in proper condition, and attention is periodically given to their regulation. To have conquered the lay theory of "bad gas" is a strong point in favour of the policy, but that is not the ultimate object. What we want to strive for is the highest possible contentment, for that has effective advertising power, and is the best inducement to the extended use of gas by the individual. We need not discuss the reasons for the adoption of the policy. They have had long existence. But they have become insistent; and we cannot understand gas suppliers resisting the inevitable, with, in view, business maintenance and progress.

Those gas salesmen who have read the report (published in our May issue) of the Southern (London Area) Circle will have been interested in the paper by Mr. J. Davis, of the Sutton Gas Company, and the discussion which followed. There are two or three points which strike us in connection with the proceedings which it may be profitable to emphasize. The first one is the unanimous favour to the policy shown throughout. There was no opposition; no one said it was wrong. Everybody knows that, no matter how faithfully the gas supplier looks after the interests of his concern up to the meter, all the good work may be negatived, and the hoped-for effects frustrated in the vital quarter, the other side of the measuring instrument, if the conditions for utilization are not correct. Small, medium size, and large undertakings are adopting the policy; and the testimony as to good effects is unanimous. We have Minehead (see "JOURNAL" for May 20, p. 530), with an output of only 48 million c.ft. a year, testifying to the advantages which result. We have the Sutton Company, with a very short experience, expressing through Mr. Davis gratification that they entered upon this work. We have Portsmouth wholly satisfied with their large experience in the matter. In Mr. Davis's paper, we see that it was only in November last that the Directors of the Sutton Company decided to initiate a form of combined survey and maintenance; and up to April 18, no less than 2393 gas appliances of different kinds (including 441 ordinary meters, 401 cookers, 796 fires, 570 burners, and smaller numbers of other appliances) had received attention. Also during that period a pleasing number of new appliances were sold or let on hire.

The point, however, that we wish particularly to make is that of the cost of doing this work. It must be borne in mind that in the initial stages—while the rough work is being done of weeding-out defects and putting appliances into good condition—the costs will be much heavier than they will be when that work has been accomplished. Take, for example, Sutton. Up to April 18, the expenditure was £68 3s., and the number of houses visited 441, which works out to approximately 3s. 1d. per consumer. This item in itself is not a serious one, seeing that, taking the average consumption per consumer per annum, Mr. Davis estimates that the cost is only approximately ½d. per therm sold. That fraction of a penny per therm to secure satisfaction is good expenditure, and is a small burden on the price of gas. The neglect of the expenditure might be eventually a serious burden on the undertaking. The displacing of inefficiency by efficiency is an economy for the consumers; and it is material defence of the interests of the proprietors of the concern. We have Mr. A. J. Garward in the discussion speaking of the cost of the work to date at Portsmouth. He says that it has averaged 2s. 2·89d.—that is, the cost of labour has been 1s. 11·5d., and cost of material 3·39d. The costs may be taken as being those of inaugurating the system in the respective circumstances; and we maintain that they are, in view of that, extremely low. The figures too will, as time passes, be materially reduced, in view of the fact that appliances once put in order will subsequently be easy to adjust and maintain in efficient condition. This point as to the reduction

of costs was well made by Mr. John W. M'Lusky in the paper he read before the North British Association earlier in the year, as mentioned in "THE GAS SALESMAN" for April (p. 80). In the case of Glasgow, the maintenance costs at the outset were estimated at 1½d. per 1000 c.ft.; but, at the time Mr. M'Lusky read the paper referred to, they had been reduced to 0·592d. per 1000 c.ft. Of this figure, he stated labour accounted for 0·375d.; material, 0·084d.; and overhead charges, 0·133d. Per therm the cost was 0·126d.—labour representing 0·08d.; material, 0·018d.; and overhead charges, 0·028d. Some undertakings have been deterred, through misconception as to the actual costs, from adopting the policy of inspection, adjustment, and maintenance of consumers' gas appliances. There is no doubt that experiences such as we allude to will help them to come to a politic decision in the matter.

Another point for determination is as to whether all appliances should be inspected and maintained at the same time, or whether they should receive seasonal attention. That is to say, whether lighting burners and gas-fires should be the subjects of inspection in the autumn, and probably again in mid-winter, while cookers and hot-water appliances should be the subjects of visitations in the spring. In our opinion, while the maintenance man is in the house, it would be better for him on the occasion of each visit to give oversight to the whole of the appliances. There is in these days no marked seasonal division in the use of gas appliances. Lighting burners are required all the year round—true to a less extent in the summer than in winter. Cookers, through their convenience and readiness for service, are also now utilized the year through. The same applies to water-heaters; and as to gas-fires we were thankful they were in existence some of the early mornings and during the evenings in the month of May. This climate of ours is doing something to make the valleys less deep in the load curve of the year.

Efficiency Tests.

IN all parts of the public service department of a gas undertaking there should be efficiency. Most administrators of gas undertakings are now mindful of the fact that it is highly necessary to do all they can to promote the efficiency of their sales staffs. Many of them, too, have excellently appointed showrooms; but we have noticed on more than one occasion allusions in discussions to the indifference that is sometimes shown to assuring that appliances exhibited in showrooms are of high efficiency. Where this applies, it is a great pity, because the showrooms of gas undertakings of all places should demonstrate good types of appliances. Moreover, unless there is assurance through tests that the appliances are the best that can be procured in respect of efficiency, the undertaking neglecting this duty is not rendering the best service to itself and its consumers. The point was raised in a paper which Mr. H. D. Madden read before a recent meeting of the Wales and Monmouthshire Institution of Gas Engineers (see "GAS JOURNAL" for June 10). In this he held—and rightly—that no gas-consuming apparatus should be shown or offered for sale unless it has first been tested and found eminently suitable and efficient in use with the gas supplied to the district. There will be general concurrence by gas salesmen that all types of appliances should be carefully tested under conditions of pressure with the actual gas provided, and that this should rigorously be kept to a standard calorific value and regular specific gravity and composition. Recognizing that it is possible to reduce to a negligible point the limits of deviation from predetermined gas values, the Cardiff Gas Company have arranged a physical laboratory wherein all domestic and industrial appliances are tested and scrupulously examined. There is an advantage in such a laboratory beyond that of testing and giving assurance that the appliances are of the right standard in respect of efficiency and structural fitness. That advantage is that it can also be utilized (as is the one at Cardiff) for giving the outdoor staff first-hand knowledge of the methods of testing and of the results obtained. Of course, the provision of laboratories for appliance-testing purposes is no new thing among many progressive gas undertakings. Such laboratories have long been established; and the benefits that have been derived are undeniable, especially as a means for certifying that a gas undertaking is in its purchases of appliances receiving good value for money, which value is passed on to the consumers of gas. We quite agree with Mr. Madden that salesmen should have to deal with nothing but good and efficient apparatus, and that all appliances should be eliminated which primarily may appear cheap, but are ultimately troublesome and inefficient, and thereby cause annovance and dissatisfaction among consumers.

Showrooms and Secondary Products.

THE main object of Mr. Madden's communication, to which reference is made in the preceding article, was to discuss ways and means whereby the value of showrooms could be developed. One way suggested was the promotion of the sales of secondary products, particularly coke and sulphate of ammonia. All gas salesmen know how important to a low net cost of gas into the holders is the maintenance of a good revenue from secondary products, and that the low net cost of gas is reflected in the charge to the consumers. Therefore the secondary products constitute a factor of great importance in the work of the gas salesman. Mr. Madden urges that showroom attendants should have imparted to them a good knowledge of the utilization of secondary products, and that there should be exhibits of graded coke and of sulphate of ammonia in the showrooms—thus utilizing this effective means of enlarging local sales. At Cardiff, the Company are in their various showrooms and offices exhibiting clean good coke, in graded sizes for all applications. The exhibits are in attractive form, with proper literature as to the use of coke ready to hand. It has been found that this method of propaganda does much to popularize and further the use of coke locally for domestic and industrial purposes; and, if carefully handled, Mr. Madden says the coke will compete with, and largely take the place of, anthracite for enclosed stoves and water-heating apparatus. The experience enables him to assert that this form of publicity is astonishingly effective; but he stresses the point that the showroom officials must be in possession of correct knowledge regarding the suitability and use of the graded sizes of coke, and be able to advise consumers accordingly.

With regard to sulphate of ammonia much the same may be said. Given a good exhibit and the necessary knowledge on the part of the showroom attendants, excellent results may be secured in the local sales of this product. The Cardiff Gas Company recently commenced to offer neutral dry sulphate of ammonia in 7-lb. linen bags with instructions for use printed on the back. Due prominence was given to the new enterprise in all the showrooms; and the result was that in a few weeks over 1500 individual sales were made, with, in addition, many inquiries, which represent potential custom. In other words, publicity brought this valuable fertilizer to the eye of the public; and they purchased sulphate locally. This work has also brought inquiries for quantities of one or two ton lots from small landholders many miles away. Also requests for further information and literature have come from a large radius—the applicants being mostly farmers and amateur gardeners who have awakened to the fact that gas companies produce a splendid fertilizer. There is also a good local field for the commodity in the form of lawn sand. This will find a ready sale in most towns and districts where there are large numbers of small grass lawns to residential properties. There is no question that local showrooms in the present day require studying with a view to developing their utility to the maximum degree.

The Largest Loaf.—In Minneapolis, where they make wheat into flour, a bakery has, according to the "Intercolonial Gas Journal of Canada," produced in a gas oven a loaf of bread 60 ft. long, and weighing 400 lbs., which is said to be the largest single loaf ever baked. Bakers have met the high cost of labour and materials by using improved methods to keep down the cost of bread. Old-fashioned coal or coke fired ovens, with uncertain heat, have been replaced by gas-fired travelling-hearth ovens, 100 ft. or more in length, in which a uniform heat of any desired degree can be accurately and automatically maintained. The same paper points out that it takes about as many bakers to furnish bread for the whole of the population of the United States as are required for the 2 million people of Paris. This is due to the use of the modern travelling gas-heated ovens by the wholesale bakeries of America. One of these travelling ovens operated by two bakers can turn-out more bread than can dozens of bakers using old methods.

Showroom Window Display at Derby.

[Photo. by Edgar Jones, A.M.I.Chem.E.

The accompanying photograph shows the window display of the Derby Gas Light and Coke Company which was arranged for the visit of the Institution of Gas Engineers to Derby on June 12. The window, as can be seen, was simply and artistically arranged to demonstrate the value of gas for cooking, heating, and lighting, and the service direct from the cooker to the table, with minimum amount of trouble on the part of the housewife.

The apparatus was supplied by Messrs. John Wright & Co., of Birmingham, and arranged by Mr. Keeley, District Representative. The china was loaned by the Royal Crown Derby Porcelain Company, whose works were visited by a large number of gas engineers.

The display has attracted a large amount of attention by its simplicity and neatness, and it is anticipated that a considerable amount of business will accrue from such a distinctive advertisement.

Hotel Apparatus.

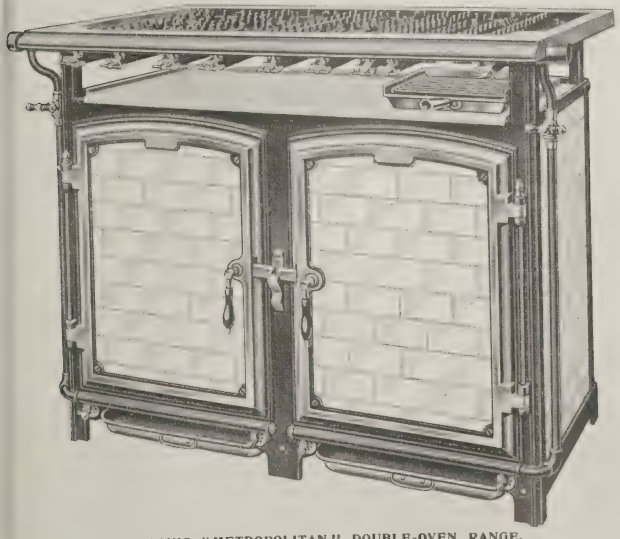
The white enamelled exterior, finished resemble glazed bricks, which is be- ming so familiar a sight on the domes- gas cooker, has been introduced by the avis Gas Stove Co., Ltd., in large cook- g appliances for hotels and restaurants. In their new catalogue, which contains most interesting pictorial selection of ieir improved large gas cooking appar- tus, the Davis Company thus present the ase for the cleanliness of gas in the hotel itchen: "It is well-known that one the many merits of gas-cooking, on ther a large or a small scale, is its eanliness. Gas is not only much cleaner use than solid fuel, but the absence of noke and dust encourages cleanliness in ie kitchen staff to a marked extent. In is booklet may be seen illustrations of avis gas-cooking appliances equipped xternally with white enamelled panels. ne cannot fail to be impressed by the icture of spotlessness presented by the itchens in which this apparatus is in- alled."

They have much also to say about the advantages of gas-cooking in hotels and restaurants, and they say it with admirable brevity. For this very reason the case gains so much in force that many a waverer into whose hands the booklet falls will find himself converted to a staunch belief in cooking by gas; and his decision will be confirmed by the neat, clean, and generally efficient appearance of the installations carried out by the Company, and illustrated in different parts of the catalogue.

Very few of us can remember the time before the "Metropolitan" oven was known to the gas industry. We are reminded in the booklet that it has been in existence for over forty years. In its up-to-date form, with white tile pattern exterior, and an improved type of hotplate, it occupies the premier position among the ranges in the catalogue. Though only double and treble oven sizes are actually listed, any practicable number of "Metropolitan" ovens can be ranged together under a continuous hotplate.

The series of Davis roasters, steamers, and hot-closets illustrated and fully described in the booklet represents a selection for all the ordinary purposes of large kitchens. Most of them have the clean white tile pattern finish, and all embody the most modern features.

There is no doubt that, apart from its value as a trade catalogue, the new Davis booklet will prove itself a valuable piece of propaganda for the increased use of gas by the large-scale caterer.



THE DAVIS "METROPOLITAN" DOUBLE-OVEN RANGE.

Gas for All Purposes at Margate.

In the "Bournemouth Daily Echo" for June 6 is an account of the many applications of gas at Margate, where, thanks to the enterprise of the Isle of Thanet Gas Light and Coke Company, gas is put to every conceivable use.

Hairdressers have adopted gas "curlers" for shingled locks in preference to electrical appliances. Carriage body builders are using gas driers; dairymen are using gas plant for sterilizing their bottles and in the preparation of pasteurized milk; self-ventilating gas fires have been fitted in hospital wards; bakers are using gas ovens; and confectioners employ gas for sugar-boiling processes. One enterprising trader has installed gas engines for the manufacture of huge quantities of ice cream, and uses his engines to work a miniature saw mill for a firewood business during the winter months. Dentists are using gas sterilizers, and photographers have installed gas drying apparatus for the inauguration of a new two hours' service and the development of amateurs' films and prints.

The lighthouse at the end of the Stone Pier has a gas installation. And the Trinity House leading mark for ships on the jetty shows a brilliant green beacon as testimony to the reliability of gas. A gas main has been laid at beach level, and bathing belles in the bungalow huts at Palm Bay bask in the warmth of gas fires whenever the sun forgets to shine. Church organs that suffered from colds and wheezes as a result of the non-warming properties of new electric light installations have been cured by gas heaters.

One of the most instructive examples of the rapid development of gas in relation to business at Margate is that of a local fried fish shop which has just been supplied with a special 3-in. main and 300-light meter to deal adequately with the daily "catch."

An Elementary Treatise on Gas Lighting.

For the Student Gas Salesman.

[COMMUNICATED.]

CHAPTER 10.

(Continued from p. 103.)

Having discussed the cost of the light as produced by different sources, we are now required to consider the equally important (but often neglected) question of quality. A source of light exhibits two principal features—intrinsic brilliancy and colour—and its standard of quality is assessed thereupon. As will be seen from Table 9, sources of light differ very widely in regard to their relative brightness or intrinsic brilliancy.

By far the most noteworthy point in connection with this table is the relatively small difference between the intrinsic brilliancy of ordinary luminous flames and that of the incandescent gas mantle, as compared with the enormous disparity between the brightness of flames and electric sources. The very great brilliancy of certain sources renders them, in their unshaded condition, "menacing from the oculist's standpoint."

As already mentioned, a measure of intrinsic brilliancy is obtained by dividing the candle-power of any light source by the area of the luminous surface; but "this quantity is very difficult to determine accurately, since, with the exception of the electric incandescent filament, no source of light is of uniform brightness over its entire surface; and for the sake of comparison we can only arrive at approximate values by assuming equal brightness over the generally effective lighting area of any radiant." (Bell.)

According to the late Dr. Louis Bell "the eye cannot comfortably endure a greater brilliancy in the source of light which is entering it, either directly or obliquely, than about 5 c.p. per sq. in. of lighting surface—*i.e.*, about the brightness of a petroleum lamp flame." There does not, however, appear unanimity of opinion among eye experts as to the maximum brightness that can be borne continuously without any physiological strain. While much lower intensities than 5 c.p. per sq. in. have been suggested, the contrary view has been expressed—that the eye is not seriously endangered by exposure to higher brilliancies. Those who state that values of the order of 2 to 3 c.p. per sq. in. ought not to be exceeded, presumably base their opinion on the fact that the average brightness of the sky is about 2·5 c.p. per sq. in. But a brightness of 10 c.p. per sq. in. does not seem to be unduly distressing to the eye, and in practice artificial light sources if subdued to 5 to 6 c.p. per sq. in. (an intensity which represents a reasonable standard for ordinary working purposes) are satisfactory as regards visual comfort. However, we can leave this controversial matter to those who are competent to argue the case, since it is the intention here merely to make the point that one of the good features of the incandescent gas mantle is its relatively low intrinsic brilliancy. Low intrinsic brilliancy is of great importance for the avoidance of eye fatigue; and a perusal of the values given in the above table at once reveals the marked superiority that gas possesses over electricity in this essential respect. The care of the eye should be carefully considered when deciding upon the type of light-source to employ; and (quoting from "Light and Illumination")* "one should therefore know something of the nature of this organ in order to understand why some lighting conditions are pleasant and others are the reverse." Fig. 135 is a diagram of the human eye. "The light first passes through an outer transparent layer, known as the cornea, then through the chamber behind, and the eye-lens, ultimately reaching the very delicate and sensitive layers on the retina, where the impression of light has its origin. This impression is despatched to the brain by the optic nerve. Now the retina has the power of adapting itself to light and darkness in a wonderful manner. Besides this, the pupil aperture of the eye acts as a safeguard (see figs. 136 and 137), opening to its fullest extent in comparative darkness so as to let in as much light as possible, but contracting in proportion to the brilliancy of the illumination so as to shut out excess of light. Partly by the alteration of the pupil aperture, and partly also by changes that take place in the retina, the eye can adapt itself to wide changes in the illumination; but the process of adaptation takes time, and is only possible within certain limits. If the eye is exposed to very sudden contrasts in brightness, or to a brilliancy so great that it cannot protect itself, the eye is bound to suffer. In many cases after staring at a bright source for a short time, and then transferring the gaze to a relatively dark background, one can see a bright 'after-image,' showing that the eye has been temporarily fatigued; and it takes some little time to return to its normal condition.† This effect is commonly described as 'glare'‡—the cause of which is the concentration of light over a small area and the degree of concentration, which is expressed in terms of candle-power per square inch of the radiating surface of the source, is what we mean by intrinsic brilliancy. Glare has to be cured; and it is one of the main purposes of globes, shades, and reflectors to prevent glare by softening and diffusing the highly-concentrated light of modern sources. Obviously, those high sources such as the tungsten arc (known commercially as the "Point-o'-Lite") and tungsten filament gasfilled lamp, which are, to their great disadvantage, possessed of very high intrinsic brilliancies, require much more attention in regard to curative treatment for glare than the vacuum metal-filament lamp; and the last-named needs screening to a greater extent than the incandescent gas-mantle, and so on in proportion to the fall in the brightness of the source.

Dr. Meredith Young,‡‡ in remarking that it may be taken as proved by physiological experiment that the human eye cannot admit with comfort a greater brilliancy of light than that of the Argand gas-burner or ordinary single-burner oil lamp, calls attention to the fact that (taking 5 c.p. per sq. in. as the degree of permissible brightness of a light-source "an upright incandescent gas mantle possesses an intrinsic brilliancy of about 20 c.p. per sq. in.—hence it needs a diffusing globe or distributing reflector, or frosted globe of about four times the area of the source, in order to reduce it to the required physiological amount. A carbon filament having an intrinsic brilliancy of (say) 400 c.p. per sq. in. would require a diffusing globe of about 80 times the area of the source to discount its excessive brightness; and metal filament lamps having intrinsic brilliancies varying from 600 (for the tantalum lamp) to 1000 (for the tungsten lamp) should, on the basis of the average brightness of 800 c.p. per sq.

* See "The Illuminating Engineer," Vol. V., December, 1921.

TABLE 9.—*Brightness or Intrinsic Brilliancy of Sources of Light.*

Source.	C.P. per Sq. In.
Sun	800,000 (A. P. Trotter)*
Searchlight, modern	400,000 "
Electric arc, naked	20,000 (J. Darch)†
Tungsten electric arc ("Point-o'-Lite")	12,900 (Dr. Thomas and D. Chandler)‡
Tungsten electric filament gasfilled lamp	5,250 (A. P. Trotter)
Flame arc	5,000 "
Nernst (zirconium electric filament) lamp	3,000 (Dr. L. Bell)§
Tungsten electric filament vacuum lamp	1,100 (Dr. Thomas and D. Chandler)
Carbon electric filament lamp	400 (average) "
Gas-mantle, high-pressure, inverted	250 "
Acetylene flame	60 (A. P. Trotter)
Gas-mantle, low-pressure, inverted	40 (Dr. Thomas and D. Chandler)
" " upright	23 (A. P. Trotter)
Frosted tungsten electric filament vacuum lamp	10 "
Argand gas flame	7·5 (Dr. Thomas and D. Chandler)
Petroleum lamp flame	4 to 9 (A. P. Trotter)
Batswing gas flame	3 to 4 "
Candle flame	2·5 "
Sky (average brightness)	2·3 (Dr. Thomas and D. Chandler)
Moon	2·0 "

* Taken from "Illuminating Engineering."
† Taken from "Trans. Roy. San. Inst.," Vol. XXXI., No. 10.
‡ Taken from "Illumination by Gas"—one of the World Power Conference Papers read in July, 1924.
§ Taken from "The Art of Illumination."
|| NOTE.—Presumably when burning 16 c.p. gas under the old illuminating power standard.

† Dr. Meredith Young ("Light and Sight") may be quoted as under in exemplification of this point:

"The intensity of the action of light on the retina can be demonstrated approximately (I do not put it at all high) by the production of fatigue or after-images. The thing can be easily tested (though in the case of the more brilliant lights the experiment is no pleasant one) by staring as steadily as possible at the source of light and then, in the darkness, finding out, by means of an assistant, the duration of the after-image. The image tends constantly to fade away, but a flicker or blink of the eyelids causes it to reappear very bright for the fraction of a moment. The image from a 50-c.p. Osram lamp is to my eye, at first yellowish, then reddish-yellow, then—somewhat suddenly—a beautiful violet, and this drifts gradually into black. The lighter colours usually have a dark halo, and the dark colours a light halo. Tested in this manner I found as the mean of a number of trials the following persistence of the after-image:

50 c.p. Osram lamp (new)	3 mins. 3 secs.
16 c.p. carbon filament (new)	1 " 45 "
Inverted incandescent gas burner	1 " 10 "
Wax candle (Price's), 16 to 1 lb.	33 "
Bryant and May's special (small) safety match	2 "

"It is important in any such trials that the eye be kept focussed as nearly as possible as it was when gazing at the light, otherwise it may be thought that the image has disappeared. I think these observations lend some support to the view that bright lights in the field of vision at all events help to induce exhaustion of the retina and eye-strain, and that the brighter such light the greater the exhaustion or strain likely to result."

‡ "The term 'glare' is perhaps a little difficult to define precisely, but it is now almost invariably used to describe conditions of excessive brilliancy such as are trying to the eye. The glaring effect in artificial lighting is almost always connected with the exposure of the eye to bright unscreened sources." [Gaster and Dow.]

‡‡ "Light and Sight," a paper read by Meredith Young, M.D., D.P.H., D.Sc., in October, 1913, on "Some Aspects of Scientific Illumination," at a conference held at the National Gas Congress and Exhibition, London.

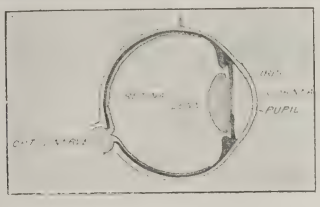


Fig. 135.

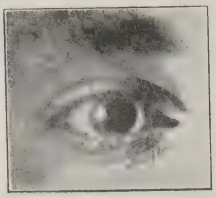


Fig. 136.—Pupil Aperture of Eye, wide open in the Darkness, so as to let in as much Light as Possible.

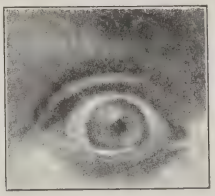


Fig. 137.—Pupil Aperture of Eye Contracted, so as to Shut Out Excess of Light.

in., be equipped with a diffusing globe at least 160 times the area of the lighting source." Reasoning along these lines, "Where," Dr. Young asks, "is the practical utility of creating such intensely bright sources of light when in the first place we have to handicap it down to the physiological limit, and when in the second place we are apt to run undesirable risks if the handicap is not what it ought to be?" Of course, neither unscreened filaments nor bare gas mantles should be used in positions where their rays can enter the eye either directly or obliquely; but the public are appallingly ignorant of, or indifferent to, this elementary requirement, as is evidenced by the numbers of dazzling sources which are placed in the direct line of vision without any attempt to discount their injurious brilliancy. It is unfortunately all too true that unshaded and inadequately diffused sources of excessive brightness are thoughtlessly located; and in these circumstances it is manifestly evident that in electric light we have an illuminant that is capable of much greater injury to the eye than gas light.

As one authority puts the case, "it is because the intrinsic brilliancy of the gas mantle is so low compared with that of the electric lamp that the light appears to be so much better diffused and altogether more suitable for the human eye."

"The eye is to some extent protected against injury from excessive stimulation by a physiological principle known as Fechner's Law. This is a law regulating the relation between the applied stimulus and the resulting sensational impression; and, stated generally, it is that the sensation does not increase in direct proportion to the stimulus, but only as the logarithm of the stimulus. Thus, if the applied stimulus be increased respectively 10, 100, and 1000 times, the resulting sensations will be only 1, 2, and 3 times greater respectively; and we probably realize but faintly how this wonderful physiological grading screens us from some of the blind sources of nature." (Dr. Young, *loc. cit.*)

Gaster and Dow, in urging the importance of avoiding glare when artificially lighting rooms, direct attention to the fact that the eye experiences a sense of weariness and fatigue when unscreened brilliant illuminants are placed in such positions that it is difficult for the eye to escape them, because the perception of such brilliant objects takes place through the formation of an intensely bright image on the retina; and consequently the effort of the retina and the photochemical pigment* to accommodate themselves to this extreme local brilliancy is very severe—sometimes impossible.

Dr. Meredith Young (*loc. cit.*) tells us that "eye strain does not cause any prominent symptoms in the eye itself; it is usually headache which is the chief symptom, and that headache may be in the forehead, the top of the cranium, or the back of the neck. One commonly observed peculiarity of this headache is that it disappears after a good night's rest, and remains away for some hours; but, if the patient resumes his ordinary occupation, it commences again pretty early in the day, and usually increases in intensity as the day wears on."

Miss M. Cleaves, M.D. (New York), in her work entitled "Light Energy," expresses the opinion that "there is no question but that the glare of unshaded electric lights is extremely bad for the eyes in house illumination; and not only discomfort, but impaired vision, results from their use." The opinion of another ophthalmic expert* reads as follows: "The electric arc-light should never be used for indoor illumination; it is too brilliant, too dazzling, and too concentrated. The naked filament or "wire-light" of the electric lamp gives an irregular shadowed field of illumination on the printed page or other near work. It should, in consequence, always be covered by a ground or porcelain glass when employed close at hand."

In this connection it must be remembered that the heavy screening of the filament here advocated can only result in the efficiency of the lamp being considerably reduced. In effect, therefore, the user pays for something he does not benefit by. He purchases electric energy to make light; but because of its excessive brilliancy a substantial proportion of the light produced is absorbed by diffusing glassware, in order to render the illuminant safe for the eye.

We are indebted to Dr. Young (*loc. cit.*) for further valuable evidence in regard to the care of the eye. Prominent among the many interesting opinions which he has so painstakingly collated there stands out the following "unequivocal opinion, from the point of view of eyesight preservation, in favour of gas-lighting, as given by Dr. Chas. A. Oliver, Ophthalmic Surgeon to the Wills Eye Hospital and the Philadelphia Hospital, U.S.A."

> "A superior grade of petroleum or mineral oil, unaided by any of the various forms of zirconium, thorium, and yttrium mantles, &c., gives a less concentrated and a less powerful, though more comfortable, working light than ordinary illuminating gas. Gas-light increased in power by any form of incandescent ash, though weaker in intensity than the malodorous compound of the two atoms each of carbon and hydrogen, known as ethene or acetylene, is, when properly diffused, much the more satisfactory and much the less harmful. The unshaded loop of electrical incandescent fibre and the naked arc of free electric fluid are the most powerful of all practical light-givers, possessing qualities which, if not removed, may lessen their usefulness as illuminants, and give rise to conditions under which prolonged near work cannot be maintained."

Another authority (Dr. Bell) calls attention to the fact that a flickering light will strain the eye seriously, and is likely to cause temporary, if not permanent, injury.

Gaster and Dow,* whose fairness is above impeachment, remark that "claims are not infrequently made for one or another illuminant that it is less trying to the eyes; but these are not infrequently of a vague and conflicting nature. One so often finds on examination that it is the manner in which the illuminant is used, rather than the quality of the light itself that is at fault. The statement so freely made at one time that electric light is bad for the eyes seems (so Messrs. Gaster and Dow say) to have originated rather in the misuse of the comparatively bright electric filaments, their exposure at close quarters without proper methods of shading, and the resultant glare, rather than in any defect in the quality of the light. But necessity—in this specific instance the necessity of removing the injurious glare of these very vivid filaments—ever the mother of invention, has done much to help forward the science and art of illumination; and the writer would indeed be ungenerous in thought and word were he here to refrain from placing on record the widely-acknowledged beneficial research undertaken by the electric lamp manufacturers in general and Messrs. Holophane, Ltd., and other illuminating engineers in particular in regard to the perfecting of a large series of standard globes, shades, and reflectors—a work in which all concerned may be justly proud." Here we must leave the question of intrinsic brilliancy, and direct our thoughts to the second factor governing the quality of an illuminant—viz., the colour of the light which a source emits.

* See "Modern Illuminants and Illuminating Engineering."

(To be continued.)

Better, Cheaper, and Brighter Cooking.—To be effective, advertising literature must be good. The Newcastle-upon-Tyne and Gateshead Gas Company have commenced another cookery campaign; and the literature which they are sending out to their consumers is in excellent taste. They point out that the woman in the home has sufficient trouble in planning and preparing over a thousand meals each year, without having unnecessary trouble with the cooking. The old way with the kitchen range means hours and hours of extra worry. Is it worth it, they ask, when for 1½d. a dinner for six persons can be cooked to perfection—with ease and to the minute—by gas?

* Mention of this photochemical pigment, termed visual purple (rhodopsin), involves a few words of explanation in regard to the chemical theory of vision. The view is held that this substance, present among the minute light-percipient organs (known as the rods and cones) situated, as it were, at the back of the retina, is decomposed under the action of light. Quoting from "Light and Sight" (Dr. Young) "this decomposition of the visual purple is now accepted as the causation of the sensation of light." In other words, light rays do not directly stimulate the termination of the optic nerve; but the visual purple is first decomposed or chemically changed by the light rays, and the decomposition products then effect the stimulation."

* Dr. Casey A. Wood—see his "System of Ophthalmic Therapeutics" (1909)—a work mentioned in Dr. Young's invaluable paper "Light and Sight," to which the reader is asked to refer for further information in regard to the care of the eye, &c.

B.C.G.A. Gas Salesmen's Circles.

Southern District—London Area.

The last meeting of the 1924-25 session of the Circle was held at No. 28, Grosvenor Gardens, Westminster, on June 2. Mr. Stephen Lacey, B.Sc., presided, and a paper on "Showrooms" was read by Mr. A. J. Privett, of Portsmouth. This resulted in a discussion which indicated the enthusiasm and interest of the members, and brought to a close a valuable session.

SHOWROOMS.

By A. J. Privett, of Portsmouth.

I have decided first of all to say something about window display and its general utility as an aid to business getting. I have decided upon this because it seems to me that some gas companies—not by any means all—do not make the best use of the window space at their disposal. They appear to fail to realize what an important part their windows play in the business.

To my mind the art of window display work is knowing how to create a greater demand for the gas appliances which we show in our windows. We ought also, as showroom people, to know how to prepare copy for showcards and window tickets, how to create atmosphere, how to attract attention, how to link-up window displays with circular and Press advertisements, and how to write "selling talk."

There are certain things which a salesman in a showroom always has in mind, such as the necessity for meeting consumers cheerfully, speaking correctly, and dressing neatly. So there are things which one must always bear in mind in window dressing, things which should come as second nature. To explain this more fully, I have taken the word "display," and have endeavoured to fit in words to help us to remember important things in window dressing.

D stands for something very important—decoration. All displays should take some form of decoration. You may not agree here; nevertheless I hold that it is essential. Such decoration need only be simple, but even then is attractive. A couple of palms, or a few artificial, or even real, flowers give the required finish to a window, and fill-in an otherwise empty space.

I for information. All windows should give some information as to the appliances on show. If we exhibit a cooker, and simply put the price on, this is information. In some instances more information must be given; but what there is, let it be right to the point.

S for suggestion. Windows should carry suggestions, more at some periods of the year than at others. For instance, at the end of the summer we should suggest, on nicely-written cards or in any other way which we think best, that the approach of autumn and winter reminds one that the time has arrived when gas fires should be installed. Make the home comfortable in readiness for the long cold winter evenings. Again, in the spring we might suggest that spring-cleaning time offers an excellent opportunity for putting in gas-fire supplies.

P for pleasing. Our windows should always be pleasing. It is rather difficult to say much concerning this, except to bring in colour whenever possible. Windows should be pleasing to the eye, because it is necessary to make a customer or a prospective one as happy as possible about the appliance which he or she is thinking of purchasing.

L for light. I think it hardly necessary for me to point out to you the merits of good lighting. We should know how to light our own windows to such an advantage as to create a desire in other shopkeepers for good lighting.

For window display work have good lighting. Well-lighted windows attract quicker than anything at night time.

A for attraction. We all know how very important attraction is in the window—important because it is the first step towards making a sale. We may have splendid appliances, but if nobody is attracted to them, they might just as well be packed in crates in the stores. While on this subject of attraction, I would like to point out the tremendous advantage of having a "live" window display such as a young lady working in a window arranged as a kitchen. The sight of someone actually at work in the window is always an attraction, and is a great aid to business getting.

The last letter in display is Y. This is an important letter because it stands for yourself. You cannot do any of these things I have mentioned unless you put yourself right into it. This is very necessary. If displays are to be outstanding, they should have a little of the display man's individuality about them. If we want to make our windows a success, we must put a bit of ourselves, a bit of our judgment, some thought, some of our ideals, into it; and then our windows will be a credit to us.

There is an important item which I would mention which could not be brought in in my use of the word display, and that is cleanliness. Do let us keep our windows clean. The glass itself should be kept clean, and in addition the floor of the window should be clean, and the appliances kept spic and span.

As showroom salesmen, we like to think that we sell the goods by our windows, but we must not overlook the fact that there are other means, such as Press advertising, circulars, "B.C.G.A." pamphlets, and the personal canvasser.

Why I have drawn a comparison between the window and other forms of advertising is because I do not think we fully realize what very valuable space our windows offer. It is the most valuable in the whole establishment.

We have heard much on the time that a window should be kept in. This is a very difficult proposition. I personally would not take-out a show within a week because we were not getting business from it directly. My contention is that, whatever you show, if shown well, you are educating the public, and therefore you cannot claim that last week's window is better than this week's. The window with the greatest capacity to sell appliances is the one which will sell this week, next week, next month, and next year, if needs be.

In my opinion, three great principles underlie window display:

1. The power to attract attention.
2. The power to create desire.
3. The power to stimulate action.

Dress the windows to strike the eye. If possible make a picture of them. Then the prospective consumer sees your picture, carries it away in his or her mind, or possibly comes into the showroom straight away.

You have created the attraction; and if your window is good you will get the desire following almost automatically. If you can get as far as the "desire" stage, you will without doubt have someone in to ask for further information. Then it is up to you as a salesman. Play up to the customers' emotions first, let them exercise their own judgment. Do not pester people. The day is gone for that sort of thing. Let them feel that they are deciding for themselves, yet at the same time work-in your own information as to usefulness, quality, efficiency, price, &c.

Showroom Management.

A very important point is the number of the staff. In this direction I think that gas companies fail in that the number is cut down to a minimum. This is a relic of the old monopolistic days. We are, perhaps, inclined to think that, as there is no other gas company in the particular town, people are bound to wait. This is bad business, especially when one thinks that if one goes into a small outfitters' shop there is usually a small army of assistants ready to wait upon one. So it should be with a gas undertaking's showroom. Let there be sufficient staff to attend to all customers without delay. Nothing is more annoying to a customer than having to wait for attention; and it is equally disquieting to the salesman who is busy with another customer.

Then there comes the question as to the efficiency of the staff. They should be capable of advising consumers upon the use of gas for any purpose whatsoever, able to explain the working of the various appliances in such a manner as to inspire confidence in the prospective buyer. In these days, too, it is of the utmost importance that they should also have a complete knowledge of electrical appliances.

Much has been said and written about showrooms' staffs as to whether or not they should be strictly practical people. Personally, I favour the commercially-trained man who has also laid himself out to gain all the information he can possibly get to assist him in his job. Many men, excellent men from a practical point of view, could not handle a prospective buyer to advantage, no matter how they tried. However, I should like to hear some opinions expressed on this point.

With regard to the stock shown, I am in favour of exhibiting as little as possible in the main showroom itself. If possible, a second room should be available for the display of the greater number of appliances. The main showroom should contain a few models carefully arranged, and, where possible, in a natural surrounding. Nothing is more galling than to see cookers and fires set-out in rows, like soldiers on parade.

Appliances should always be ticketed with a price ticket, so that people who may be walking round the showroom—possibly more or less out of curiosity—may be able to see for themselves the cost of a certain appliance. Of course there is something to be said for not pricing appliances. To have to inquire the price puts the salesman in the position of being able to talk, and may lead up to a useful sale.

A mistake is often made with regard to fittings hanging in a showroom. It is often so much easier to take a pendant or bracket from the stock room than to take it down from the showroom. However, if the appearance of the showroom is to be kept up to a high standard, when a fitting is sold it should be taken down, and a new one put up in its place. Provision should be made in all showrooms for the display of appliances in working order, so that

proper demonstration can be given. This can best be done by arranging (say) a bathroom and kitchen in suitable positions. In these, appliances such as a cooker, fire, wash-copper, sink water heater, circulator, and geyser can all be shown to advantage, and without any fear of overcrowding. This method is more pleasing to the eyes of intending buyers than a whole array of geysers or other appliances standing in line.

One has seen examples of a bad lay-out where the geyser fume pipes were many feet in length; and when five or six were displayed in one bathroom the effect was hideous. I have also in mind a display of no less than four sink and lavatory basin water heaters over one basin. The whole was confusing to gas men, so the effect upon the layman can well be imagined. So I would say again: Show appliances in working order by all means—in fact they must be shown—but let them be properly arranged.

In most modern buildings it has been arranged that consumers calling to pay accounts or to transact business in the office must pass through the showroom to get to the office. The utility of this method is best tested when accounts are coming in. Much more business is done, and it is easy to understand that people naturally look round the showroom. Then, if your showroom has been made to look interesting, and the appliances have been well set out, inquiries are almost bound to follow, with good sales as the result. Here again is an opportunity for a "live" show. During the period when accounts are being paid, considerable interest is aroused if a demonstrator can give (say) cookery demonstrations during the afternoon. The result accruing from such demonstrations is really surprising from the sales point of view, and, in addition, consumers are able to ask advice from the demonstrator upon points over which they had some difficulty. This alone brings about a friendly feeling between the consumer and the undertaking.

My next point to be dealt with is "complaints." Many are the views held on this subject; but whatever these views may be, and no matter how varied, everyone will agree that the subject of complaints is a very important one, and one which is growing in importance. It has been argued that the complaint gives the salesman an opportunity. In a few instances this is true; but as a whole I do not think that much business is picked-up by dealing with consumers' complaints. The ideal method, to my mind, is to have an intelligent junior in charge of a table or cash desk, such desk to be in a conspicuous position, and labelled "Complaints." At least 90 p.ct. of the complaints brought-in could be dealt with effectively at such a desk. Should there be anything in the remaining 10 p.ct. which called for higher knowledge than that of the junior, then let a competent member of the showroom staff deal with it.

However, whether this method or any other method be adopted, let it be worked in such a way that the consumer is not directed from pillar to post before obtaining satisfaction. The method for dealing with complaints which I have just suggested would, I feel sure, work very satisfactorily so far as the undertaking was concerned. Before passing on, though, I would like to point out what I consider the one stumbling block in such a system. Looking at it from the customer's point of view, a bad impression may be given by the fact that it is necessary to have a special desk and special clerk to deal with complaints. The thought would at once come into their minds that appliances, &c., must be in a very bad and inefficient state to warrant the setting-up of a special desk to receive complaints.

I think the time has gone by when one needed to urge that "B.C.G.A." literature should be used in showrooms. Everyone has realized what an asset this is; and I can only suggest that we go on using and distributing this literature for all we are worth. The effect is not always felt at once. Possibly the husband or wife of a family, or even the children, pick up a pamphlet, and nothing is thought about it at the moment; but in a day or two it is discovered in a coat pocket, and is read and re-read, with the result that business is done to the benefit of the undertaking.

When speaking just now about windows, I emphasized the need for keeping them clean. The same thing, of course, applies to the showroom itself and the goods or appliances. In view of the fact that many people labour under the impression that gas causes an excess of dirt, it is necessary to do all that is possible to destroy this impression, and to let people see that gas is the clean fuel which we hold it to be. Therefore the people who are employed to do the cleaning should be kept up to their job, and the whole showroom, including the appliances, should have an atmosphere of absolute cleanliness. Where woodwork other than a polished wood is employed in the structural features of the showroom, I suggest that the decoration be carried out in white, and the walls coloured with some light clean colouring. Not only will this give an impression of wholesomeness, but will also help to convince people using the showroom that gas is the cleanest fuel.

Again a consumer or prospective one will be dubious about installing gas fires on the ground that plants used for decorative purposes in the house are killed, or at least assume an unhealthy condition, when gas fires are used. From my own experience in the showroom, I have found that there are a number of palms and fern plants which will thrive in a gas showroom.

Not only does the use of plants help to persuade an otherwise dubious buyer of a gas fire, but the plants themselves are a decided asset in the decoration.

In the showroom at Portsmouth a convenient space is set aside where a table and one or two comfortable chairs are placed. Here people frequently sit and rest; and we like to encourage this sort of thing. We like people to feel that they are at liberty to walk in if they feel disposed without being pestered to buy. Incidentally the table which I mentioned has an abundant supply of "B.C.G.A." literature upon it; and people who sit at the table read, and by this means we have helped towards the great ideal of educating the public to the use of gas. The showroom should be homely, and of such a nature that people feel it a pleasure to come in and rest or walk round at liberty. Get them in, and get them interested, and inquiries will follow, with sales as a result.

Another very important point which concerns the showroom staff is the co-operation with the other departments of the undertaking; and here is a point where and why I favour the commercially-trained man. The man in the showroom should have a knowledge of the various methods of working in the office. It is said that the books must be accommodated to the business, and not the business to the books. This is very true. At the same time, if the showroom staff do not fully understand the "inside" methods, some wholesale blunders are likely to occur, and ill feeling often results. We are all spokes in a wheel, and one cannot get on without the other, so that co-operation in its fullest sense should be the order. While on the subject of co-operation, I would like to emphasize the need for this between the showroom manager and the buyer. In some undertakings the showroom manager buys the stock for his showroom. However, in many cases this is not so. It is up to the showroom manager to keep the buyer well posted in the type of appliance which is selling best or likely to sell best, due regard, of course, being paid to efficiency.

Discussion.

The CHAIRMAN remarked that they had all listened with interest to the paper. Mr. Privett had not said anything about the size of the showroom. It was often very difficult to arrange an effective display in a relatively small showroom window.

Mr. W. D. MEDCALF (Gas Light and Coke Company) said he would like to congratulate Mr. Privett on his paper, with the main points of which he (the speaker) was in sympathy. The underlying suggestion was the need for making their displays more effective. Perhaps he could best discuss the paper by telling them of one or two of the main principles employed by the Gas Light and Coke Company. First of all, it was desirable to avoid over-crowding. A spacious building was in itself impressive, and made the general public realize that the gas industry was very much alive, and was growing in strength. Secondly, his Company attempted to group apparatus. Instead of having a heterogeneous display of fires, cookers, geysers, &c., they had one section devoted exclusively to cookers, another to fires, and so on. It was their endeavour to have suitable surroundings for each appliance, so that customers could concentrate on one piece of apparatus at a time, instead of having their attention diverted by the close proximity of others. Cookers, for example, were isolated by being placed in a suitably tiled recess. As for fittings, it was advisable to arrange pendants on each side of the showroom ceiling, leaving the centre space free. By doing this, they had found that the selection of fittings by customers was greatly facilitated. Showroom windows certainly constituted a difficult problem. There should be no platform, and the window itself should not be higher than 18 in. from the ground. It was, of course, easy to talk of good display; it was a different matter to carry out their ideas in practice. He wondered whether they really knew what they wanted. Did they desire to base their displays on some particular apparatus, or did they wish to demonstrate what was meant by gas service? Often, suggested Mr. Medcalf, it was a good plan to have a folding screen as a background to a window display. This enabled them to have a centre exhibit and two wings; and, while giving sufficient background to lend a pleasing and co-ordinated appearance, it avoided the expense of an elaborate and permanent background. He did not agree that palms, &c., should be put in to fill up any odd space. Regarding the lighting of showroom windows, did Mr. Privett favour inside or outside lighting? He failed to see why appliances should be shown without price tickets attached. As for complaints, why should they use the word "complaints?" Surely "inquiries" gave a better impression. Mr. Privett had suggested that a junior could attend to complaints; but in his (the speaker's) opinion a junior had usually neither sufficient tact nor the necessary technical knowledge. The proper ventilation of a showroom was a very important point. The question of cleanliness—and every gas showroom must necessarily be spotlessly clean—brought to mind the vexed problem as to whether it was advisable to show appliances having a special finish. Personally he favoured the plan of demonstrating apparatus with a high finish. They were more easily cleaned, and gave the showroom a better and brighter appearance.

Mr. A. J. GARWOOD (Portsmouth) observed that he was in agreement with most of the points put forward in the paper. Mr. Privett had suggested that a showroom should be amply staffed, so that there was always a salesman ready to attend to a customer as he entered. A large staff was, of course, very desirable on a busy day; but on a wet day, for instance, when few customers called, some of the staff would have nothing to do. At Portsmouth they had encountered the difficulty by arranging for their outdoor canvassers to assist the ordinary showroom staff on busy days. Mr. Privett had also suggested that salesmen should have a knowledge of electrical appliances. In a country district, said Mr. Garwood, this knowledge should be extended to embrace apparatus for burning oil, which in outlying districts was still a hardy competitor, and one often difficult to displace. And then there was the question as to who was the best man to employ in the showrooms. Mr. Privett

favoured the commercially-trained man. He himself thought that practical training was an excellent asset. After all, this practical knowledge could be brought to bear on many of the inquiries received in the showrooms. Regarding price tickets, he had been impressed by a practice which he had seen in a showroom in the North of England, where they had tickets giving the running cost of fires, &c., per hour. A price ticket could with advantage contain, not merely the cost of an appliance, but also the hire-purchase terms, and some information relating to its use. It was essential to keep the showrooms clean; and he would mention particularly that all showroom ceilings should be free from dirt.

Mr. L. H. Holland (North Middlesex Gas Company) was of opinion that salesmen in the showrooms should have had practical experience on the district. He also thought that the principal types of apparatus should be on view in the main showroom, where in most cases the consumers paid their accounts. If there was a separate room for cookers, and another for fires, it often happened that customers failed to see the appliances exhibited. It was a good idea to have a separate place for receiving complaints, unless the staff was large, when they could be dealt with at a special counter in the showrooms. He had found by experience that highly-finished nickel-plated appliances were often more trouble than they were worth. Customers saw a cooker, for example, in the showrooms, but when supplied with a similar cooker with steel finish were dissatisfied, thinking they had got an inferior one. The question of affording adequate ventilation in the showroom was of first-rate importance. It was often difficult to avoid steamed windows.

A Member from Tottenham remarked that, at their meetings, and in their showroom windows, attention was given freely to consideration of geysers, cookers, fires, &c., but little regard had as yet been paid to the automatic washer, which had been on the market for many years. He thought there was a big field for this appliance. The electric washer was an expensive affair, and those who could afford to pay for it were the people who sent all their washing to the laundry.

Mr. J. C. Walker said he would like to refer to the question raised by Mr. Privett as to the type of man to employ in the showroom. Personally he sided with the author of the paper when it was suggested that the best man was the one trained commercially. He believed that one of the essential qualities of the showroom salesman or saleswoman was an engaging personality, as this undoubtedly appealed to consumers. The amount of technical knowledge required of the showroom staff could to a large extent be gained theoretically. Supposing there was a discussion in the showroom about a hot-water installation. Neither the practical man nor the theoretical salesman had any right to lay-down exactly how an appliance would work in any particular house, without having first seen the conditions under which the apparatus would be used; and the man to inspect these conditions was not the showroom attendant, but the outdoor man. Turning to the question of showroom window display, did they realize sufficiently the feminine element, and its bearing on business? Did they dress their windows with the object of pleasing the feminine or the masculine mind? He suggested that they should appeal more to women, and take into account the many little points which influenced a woman's choice. These little things mattered a great deal. There were often cases when women were more concerned about a burner "popping-back" when lighted, or whether gas fires tarnished silver, and so on, than about the efficiency of a hot-plate; and gas salesmen would do well to devote greater attention to these details. The appeal to the woman of to-day was saving of labour, cleanliness, and comfort. There was another point he would mention, and that was what he would term the luxury appeal of the modern showroom. They were apt, perhaps, to give an impression of luxury which was out of the reach of the ordinary consumer. There was no doubt that they could overdo the nickel and silver plating, the oak and mahogany panelling, &c., until the suggestion was made that gas was beyond the purse of many of their consumers. They could with advantage take note of the policy of furnishers, who set-up rooms of a given value. In the same way they should make a definite and strong appeal not only to the wealthier class of customer, but also to the smallest pre-payment consumer, bearing in mind that the latter represented no less than 30 p.ct. of the gas industry's business, and constituted, indeed, one of the mainstays of the industry.

Mr. Holland remarked that he had tried the effect of having a price ticket on every appliance in the showroom window, and also of leaving the apparatus unpriced, and only having showcards in the window. He had found the latter method preferable.

Mr. J. H. Johnson (Hampton Court) gave a few details of the management of a small showroom. It was the practice at Hampton Court, he said, to base their window displays on the selling of a particular appliance. As the result of a cooker display which remained in the showroom window for a week, they had received orders for 24 cookers. The outside lighting of the showroom was by low-pressure cluster lamps having a total candle-power of 3000; and the inside lighting was by similar lamps, which were concealed, and had a candle-power of 1000. By lighting the inside and outside lamps simultaneously, they could, after a short time, extinguish the inside lamps without fear of steamed windows. Regarding complaints, Mr. Johnson said that in his opinion these should not be received by juniors. The man who dealt with these should be experienced and intelligent, and should be able to look beyond the bare statement of a complaint to its possible cause. It had been suggested, both in the paper and in the discussion, that the showroom assistant should be commercially trained. He would go further than this, and say that outdoor canvassers should also be so trained.

Mr. C. F. Harford (Grays and Tilbury) remarked upon the employment of ladies in the showroom. A well-trained lady assistant was, he said, a fine asset. Commercially, they could be equal to a man. In their own showrooms a lady assistant had been with them for eight years, and they were very sorry indeed when she left, for her tactful methods of dealing with inquiries were of great value. As to the employment of "theoretical" or "practical" salesmen, it should be remembered that the outdoor man can always be asked for information and advice. Co-operation between the indoor and outdoor staff was always necessary. After all, no showroom attendant could give exact information about the working of an appliance in a particular house unless he knew the conditions which obtained in that house. He agreed with other speakers that the word "complaints" was unsuitable, and was apt to give the impression that complaints were concomitant with the use of gas.

Mr. W. Gaskin (British Commercial Gas Association) said he would like to touch upon the points raised by Mr. Privett regarding showroom window displays. Many suggestions had been made from time to time as to what they should, and what they should not, do. With the co-operation of members, the "B.C.G.A." were now in possession of some twenty ideas for window displays. These displays were available for the use of all members. Mr. Privett had raised the question of the time limit for a definite display. Figures proved that most displays began to lose attractive force after ten days, and that, except in special cases, the limit could be put at fourteen days. "Live" displays, of course, could with advantage run much longer than this; but even with these there was a limit. On the question of ventilation, Mr. Gaskin quoted the case of a showroom in the Midlands where there was a trench, 9 in. deep by 10 in. in width, running round the showroom. This trench was covered by thick layers of veneer to match the oak parquet floor, and contained gas supply pipes and also waste pipes. In this loose floor were inserted ventilating grids. Mr. Privett had spoken of the use of palms and ferns as decorations. There were, however, many other forms of decoration. Ribbons, curtains, &c., could be made to look very effective in a gas showroom. As could be seen in "Kodak" displays, and in the windows of Messrs. Lyons, the attractive scheme was an attraction *per se*, and had not necessarily any relation to the goods sold. This idea had been worked out to advantage in one of the displays made by the Portsmouth Gas Company, in which *crêpe* paper was arranged to represent the sun.

Mr. Harford mentioned that aerial photographs of the Grays and Tilbury area of supply had proved a decided attraction in the showroom window.

Mr. Sumner (Pinner Gas Company) was surprised to find that the larger companies seemed to prefer the commercially-trained showroom attendant. Of course, with large staffs it was possible to have practical as well as theoretical men; but the smaller concerns were limited in this respect, and he certainly considered the practical man as important and as useful as the theorist. As a matter of fact, both were indispensable.

Mr. W. L. Westbrook (Tottenham) observed that they needed more live displays in their showroom windows. Of course, many companies had to contend with old premises. When alterations were made, however, they should see that they had plenty of showroom space. For a medium-sized showroom, 50 sq. ft. was by no means too much. It was often an excellent plan to have a separate room devoted to demonstrations and lectures. Speaking of live displays—cookery exhibits, for example—it was necessary to fix carefully any apparatus, and make proper provision for dealing with products of combustion, &c. Waste pipes should be installed, and should, if possible, be concealed. He suggested that movable partitions could be used to advantage in a showroom window. It would thus be possible to have (say) a drawing room and a nursery or ironing room in one window. Whatever they did they should arouse the interest of their consumers. Much time and trouble could be saved if complaints were dealt with in an intelligent way, and proper inquiries were made as to the likely cause. When a fitter went to a house in order to remedy some fault, it should be his duty to inquire into the working of the other apparatus in the house. Practical training was necessary for showroom attendants, who should have both practical and commercial knowledge. Personally he would not trust a commercially-trained man to give an accurate estimate for an installation. If a salesman had no practical knowledge, he had to ask advice from one who had. In other words, two men were required where one should be sufficient. Salesmen should, for example, have a knowledge of building construction, and should be able to give proper advice.

Mr. Walker observed that the art of window dressing was a highly specialized one. Mr. Gaskin had mentioned the use of colour; and this was a big factor in catching the eye. It was necessary to make an impression quickly; and it should be borne in mind that their windows were in competition with others. This applied to all forms of advertising. Window displays were by no means easy to work out, and they should concentrate on something bright. The "B.C.G.A." would welcome the assistance and the ideas of everyone in the gas industry, and, indeed, would be glad of outside help and suggestions.

Mr. Bewsher (Brentford) remarked that gas companies did not train their assistants sufficiently in the art of window dressing. Generally speaking, he thought, salesmen were better than saleswomen, for it was seldom that a woman had sufficient technical knowledge, or sufficient patience and aptitude for learning technical facts, to make an all-round efficient showroom attendant. Regarding the staffing of showrooms, some undertakings seemed to overlook the fact that, having drawn the people into their showrooms by having attractive displays, they must have an adequate staff to deal with the increased number of customers. This problem was, of course, difficult, for people seemed to come to the showrooms intermittently in crowds. Co-operation must exist between the entire staff. When an undertaking purchased new apparatus, all members of the showrooms staff should be given full information as to its price and use. This plan was adopted with advantage at Brentford. They also had monthly conferences of the showrooms managers, and this also proved most helpful.

A Member asked Mr. Privett whether he displayed industrial appliances, and if so, what steps he took to relieve the monotony of the exhibits.

Mr. Privett, after expressing his appreciation of the manner in which his paper had been received, said that even in a small showroom it was possible to separate appliances which were let out on hire from those which were sold outright. At Portsmouth they had two branch showrooms, and were able to demonstrate a small kitchen and a bathroom. Referring to Mr. Lacey's remarks about a small showroom, he would say that, if care was taken, it was possible to make an effective display whatever the size of the showroom. Mr. Medcalf's scheme of grouping appliances was good. He (the speaker) hoped that this did not suggest crowding of cookers or fires; for it was desirable to show an appliance well, and give it plenty of space. If, for example, a cooker was placed in a model kitchen, far

more good would come of the display than would result from an exhibit consisting of a row of cookers. Speaking of the height of the showroom window from the ground, he would mention that the window at Portsmouth was necessarily higher than it should be. They had to decide whether their window display would be based on service or on appliances. Both bases were useful. In his opinion, what might be termed stunt shows did not pay from a sales point of view; and in most cases, in Portsmouth, they concentrated on displays exhibiting a particular appliance. In general, outside lighting of shop windows was at present condemned. Price tickets should be placed on appliances in the showroom; but it was often a good plan to have a few pieces of apparatus unpriced. When this was done, customers inquired the price, and gave the salesman an opportunity of effecting a sale. He was in agreement with the speakers who had suggested that "inquiries" was a better word to use than "complaints." He had mentioned in his paper that a junior could make a note of complaints. In a small showroom it was often a disadvantage for a salesman to have to leave a consumer while negotiating a sale, in order to attend to a report of an escape, or a request for burner regulation. Adequate ventilation of the showrooms was an absolute essential; and at Portsmouth they had a special plant for this purpose. They had no trouble at all from steamed windows. He was fully in agreement that showroom attendants should be commercially trained. Of course, the ideal was a combination of practical and commercial training. A salesman should certainly have sufficient technical knowledge to sell his appliances; but, after all, a salesman had no need to be a fitter. Even a practical man could not give an accurate estimate in the showroom unless he was fully aware of the conditions under which the appliance had to work; and this usually necessitated a visit to the consumer's premises. Mr. Holland had spoken of the finish of appliances. Personally he favoured a high finish, which was easily kept clean, and gave a pleasing appearance to the showroom. Much depended, however, on the neighbourhood in which the showroom was placed. Portsmouth was not an industrial centre, and consequently they had no need to show industrial appliances. The only possible demand was for sugar boilers and fish fryers. He agreed with Mr. Walker that they should appeal to the feminine mind, and that it was necessary to cater for the poorer consumer, who was apt to be overawed by the grandeur of some gas showrooms. The ideal was to provide universal attraction. At Portsmouth there was a display Association, in connection with which meetings were held every fortnight. He was a member of this Association, and he found the interchange of ideas very beneficial. It should, of course, be realized that window displays cost money; and gas undertakings must lay-down money to get a good return. He thought that it was very difficult to obtain suitable ladies for the showroom; usually they were not sufficiently interested in their work. At Portsmouth, however, they had a staff of ladies who interviewed consumers on the district in respect of cookers, offering advice and demonstrating how to obtain the best results from gas. They also had cookery demonstrations in their showrooms. Mention had also been made of the employment of backscreens. They should be careful when using them, to see that they did not detract attention from the appliances exhibited. Backscreens should always be subservient decorations. Mr. Privett said he was in entire agreement with Mr. Westbrook, who had referred to the fact that showroom staffs should be fully informed of any new apparatus which their undertakings intended to offer for sale.

The CHAIRMAN proposed a hearty vote of thanks to Mr. Privett.

This was accorded with acclamation.

Joint Meeting of the West Riding of Yorkshire Circle and the Lancashire District (Manchester Section) Circle.

A Joint Meeting was held at Leeds on Wednesday, June 10, when about 100 members visited the works of Messrs. Wilsons & Mathiesons. They were met by Mr. W. Mathieson, Mr. James W. Wilson, and other Directors of the firm.

SCOTCH FOUNDRY.

All departments were visited, showing the various processes from the pig iron to the finished casting. In the moulding shops various methods of moulding were demonstrated, including hand moulding from loose patterns and from plate patterns, also three methods of machine moulding, including the Company's own special type of roller moulding machine engaged on making various kinds of gas stove burners and other castings of a similar nature, as well as the latest American machine for the production of baths. The Company make their own porcelain enamel as applied to their "Swan White" porcelain baths. Enamel making was seen in progress, and the application of the enamel to baths. The working of the cupolas was explained.

Lunch was served at the Queen's Hotel, Leeds, at the invitation of the firm, after which the party proceeded to the Carlton Works, Armley.

CARLTON WORKS.

In the press shop huge presses were seen in operation, which stamp out the sides, frets, and backs for the "Sunbeam" fire. The assembling of this fire was next witnessed. The various component parts are fitted together very speedily.

A new electro-plating shop (which is twice as large and has twice the number of tanks as the old one) is now in full working order, and various plating processes, from the potash tank to the final lacquering, and specially fine samples of the work were viewed.

The polishing shop is fitted with powerful vacuum exhaust tubes for drawing away the dust. Another feature is the efficient natural ventilation whereby windows on both sides of the shop are allowed to open one-third of their area. The production of "Sunbeam" radiants is carried out, commencing from the raw material, which is conveyed by a shoot to a mixing mill, and eventually passes through a machine, coming out in a plastic brick-like form. These bricks are then cut into thin layers and placed in moulds with a core between, and are stamped to the required shape. "Thermo XX" radiants for the upright type of fire are similarly made. "Sunbeam" radiants are then blacked and stoved.

An interesting feature was the display of old gas appliances, including the first gas fire which was made by Mr. H. Wilson over 50 years ago, and a gas cooker 46 years old. The rapid strides made in gas fire construction since the days when these old fires were being marketted are remarkable, and the huge stocks of new fires ready for dispatch show the confidence the firm have in the continued demand for gas heating.

The new brass shop is ventilated similarly to the polishing shop previously mentioned. In this shop various brass fittings were being finished; and a special feature was the hot stampings which are used in place of castings, &c. These are handled with remarkable speed by capstans and other lathes; the perfectly formed and well-made fittings being turned out at the rate of 1000 per day. In the black-enamelling shop the visitors saw the prime coating of various component parts, a second coat by aero-spraying, and subsequent stoving in large coke-heated ovens. In the fitting shop the testing of metal thermostats for Wilson circulators was witnessed. Great care is observed in such tests, to enable every thermostat to be sent out perfectly calibrated, thus ensuring the success of this most useful contrivance. The making of the copper circulator, showing the necessary brazing processes, evoked much interest.

In the testing shop gas grate burners, both simplex and duplex, are tested under 24 in. water pressure for pin holes, &c., in the castings, so that absolute certainty is obtained that there is no escape of gas. The tap rails for the cookers, complete with the taps, are also tested under the same pressure as well as taps and injectors used on gas grates.

Proceeding by motor coaches to the Queen's Hotel, Leeds, the members were entertained at tea by Messrs. Wilsons & Mathiesons. Mr. W. Mathieson and Mr. James Wilson presided, and were supported by Messrs. S. H. Packer (Chairman of the West Riding Circle), P. H. Christian (Manchester Circle), C. E. Wilson, Walter Wilson, A. H. Jones, A. Gilson (Secretary of the Manchester Circle), and Mr. H. Wilde (Secretary of the West Riding Section). At the conclusion of tea the following address was given.

THE PSYCHOLOGY OF SALESMANSHIP.

"THE OTHER FELLOW AND MYSELF."

By A. H. JONES, Lecturer, "Education Section of Leeds" Psychotherapy Clinic.

A definition of psychology presents certain difficulties. A mathematical genius was once asked to give his opinion of this subject. There were a number of others in the room, but it did not deter him from making the attempt. He said, "Gentlemen, psychology is that subject which says, in language which no one understands, what everybody already knows." Whether or not this is true matters little just now. Psychology is certainly in agreement with the "intuitive wisdom of the human race." But as far as the language is concerned I am not going to attempt one of the usual methods of speakers on special subjects, and try to confound my audience with technical words. Rather would I attempt a brief review of what is understood by that word psychology, and whether it can be applied to the work which you are doing.

First of all, what does it mean? There are many meanings; but the best is that which defines psychology as the study of mental facts and phenomena. This is simple, and yet its scope, perhaps by reason of its simplicity, is extensive. You have very definite knowledge of your work—that is, of selling things. Of what use is psychology in selling? It can be looked at from many points of view. You have, perhaps, heard the story of the expert called in to mend a pump. He did so, and sent in his bill, which read: "To professional services, one guinea." It was sent back for explanation, and the answer came "To mending the pump, 1s.; to knowing how, £1." This, in all probability, represents the best definition of the difference between general knowledge and exact knowledge. For instance, most of us have ideas as to what is best for our own health, for our own well-being, and yet, on the whole, these ideas are only general, and it requires a little more than general knowledge "to know how" and to have sufficient confidence to charge one guinea for this knowledge.

It is to be understood, then, that psychology is the science of mental facts and phenomena. And what is its scope? Its scope at the present day seems to include a further understanding of most of the activities of every-day life—medicine, education, social organization, industry, advertising, salesmanship, the art of learning, of remembering, of forgetting—forgetting, by the way, is just as big an art as remembering, on occasions. It it covers aspects of those activities in general terms, what can it cover in more exact terms?

If one just examines its effect on industry—to take one, out of many possible subjects—one discovers that psychological investigation is throwing considerable light on the causes of fatigue. It is bringing an understanding of the various activities that go to make one's every-day life—of the various ideas and attitudes of mind, of emotions and feelings, of concentration on one's work. One finds that it is aiding advertising; that it is even aiding salesmanship. Those of you who have read what is, I believe, the latest book of Stephen Leacock, will remember his chapter on salesmanship. There he defines advertising in terms of modern American methods of psychology. You will probably remember one of his definitions, that advertising is the art of "arresting the human intelligence long enough to sell it something."

What value has psychology for salesmanship? I asked a question of a salesman in this way. "Do you believe that there is any psychology in salesmanship?" He said "No, there ain't no such thing. All you have to do is get to know the other fellow, find out his mood, discover whether he wants the thing you want him to have . . . . "—and he went on for about 15 minutes. He was then asked, "And what do you call that? What have you been doing? You have been describing the qualities, the ideas that are required to sell somebody something he may or may not want." He said: "I don't know. But it ain't psychology, anyhow." We left it at that, but some of those statements are worth looking at. Suppose the subject is discussed in four divisions. First one considers the article; next, the "other fellow," the customer; next, oneself, who is selling; and fourth, the interacting effects between the customer and oneself. The article is placed first. Presumably, one has some knowledge of that article. Yes, but how much knowledge?

How is one going to present that article? Is one going to describe it on its merits, or is one going to draw comparisons with other articles of a similar nature? This is sometimes rather dangerous! Undue exaggeration about any particular article is neither common-sense nor psychology, unless it happens to fit in with the demands or desires of any particular customer. Even then, it is a doubtful method. In fact, one is tempted to say that exaggerating the qualities of an article does not always bring belief to the mind of the customer. It may add 6d. to the salesman's commission; but this 6d. is being earned at the expense of his self-respect, and, instead of being placed to his credit, should really be placed on the debit side of his account.

Leaving the article, one approaches the aspect of the "other fellow." He is important whenever there is an opportunity of selling him something. This perhaps is another point where modern psychological research has helped considerably. First of all there is the growing knowledge of what makes the difference between types of customers. There is the very domineering type of man who comes in and wants to sweep the whole shop away as well as everybody in it. He requires special treatment, for he is going to have everything he wants in the way he wants; and if he does not get it, out he goes. There is the man who would rather go round by the back door than enter by the front, and who has to be persuaded. There is the individual, either a buyer or a seller, who would rather avoid going in either by the back or the front door; and if he can put down on his report "the people were out," it would give him intense satisfaction. Another type is most decisive, most deliberate; another always acts impulsively. There are psychological reasons for all these differences. They all require different methods of approach. But if one knows the why and wherefore——? The individual who said there was no such thing as a psychology of salesmanship had, however, learned from experience this one most important factor, that every potential customer is a special study, a special law unto himself.

There are some salesmen who are very successful in their own home district, but if they happen to be moved—if, for instance, they are brought from Kent to Lancashire or Yorkshire—they would find sometimes that those methods which were most successful in the South seem to "gang awry" in the North.

A certain firm once sent up a Londoner to Manchester. He was supposed to bring the same success into his work in Manchester that he had brought in the South. In three months he was recalled, because he had no capacity for making his own inner adjustments, to adapt himself to the different requirements of that particular district.

Now how can one deal with those various types? Suppose, to find an answer, one looks at oneself. Now psychology studies moods, feelings, and temperament, attitudes of mind, mental qualities, the cause of certain effects, conscious and unconscious processes. Take the case of a salesman going to his salesroom early in the morning. Suppose one has come down to work with the thought that one would rather be elsewhere. Is that going to have any effect on one's attitude towards work during the day? Or suppose an opposite case is taken, that which has the "little daily dose" feeling. The first state, in all probability, is going to induce irritation with the customers, because something has happened to oneself. The other one, providing his feeling is not too pronounced, will get on very well with the customer. And why? Is it the fault of the customer, or is the reason to be found within oneself? The question of success or fortune lies within oneself. For everyone who can do well can also do better.

One of the most important facts that follows is that which is called interest—especially the degree of interest that one has in one's particular work. This depends on whether work is a means to an end or an end point in itself. If it is a means to end, the interest is likely to be good. It will tend to bring in those psychological attitudes of mind—concentration, observation, attention—that control of emotion, that "something" which will enable one to give attention to detail which will bring about the desired result.

And what is the attitude of mind in general? There again many questions arise, such as inferiority or superiority in regard to types of customer, fear of losing one's position, or the desire to get higher. All these, either consciously or unconsciously, are going to have an influence in the quality of one's work. One always has a certain manner which is going to have its effect on the customer.

Now it may be of interest to have a look at some of the effects of these states of mind. Perhaps in modern times one of the greatest desires most people have is for security in some form. And this desire for security—a well-known psychological fact—is something that unconsciously influences one's conduct in a manner one can hardly realize. Some of its effect acts in this way. One is perhaps not quite sure of one's own knowledge and methods. One is perhaps not quite satisfied with the position one is holding, and yet one is sometimes afraid to take the necessary risk of making experiments. The fear may be the result of the desire for security. If one is prepared to take risks, especially "mental" risks, one finds the necessary courage and initiative.

One salesman, answering a question about the success he had had for a time, said this: "I've got a certain article to sell. I tell everybody it is absolutely the very best thing on the market." Turning round to his questioner, he said: "By the way, I was not sure it was the best, but at any rate I told everybody it was." So he had success up to a certain point, and then that success left him. The reason was to be found in that idea; his uncertainty had at last begun to dominate his mind. He never felt secure. He could not approach his work with confidence. His knowledge of the article was not thorough. As a result he failed. Another one, acting on knowledge gained through study and experience, observed his customers and studied each particular one. He was not satisfied until he had thought over the result of his daily experiences, and he succeeded. But it was only because he had, as it were, decided to take the risk and go on and learn the use of perseverance and suggestion; of aloofness and intimacy; when to be indifferent and when to show keenness. He did not, like the market salesmen, judge always by appearances. Assertiveness or submissiveness were put in their place, and did not dominate his character. For he discovered that customers are affected by the attitude of the salesman, and he discovered that he, if he were not careful, was easily affected by the attitude of the customer.

Now this study, which, through the medium of a talk and without the use of technical words, I have tried to describe suggestively, gives one an idea of the attitude of mind of the customer and oneself. It helps one to decide whether a line of approach is going to be the correct one in every case or is only suitable in a few cases. It brings up the point that submissiveness or enthusiasm carried too far induces intensity, and makes one lose grip of oneself and of one's work. Relaxation and rest and change are just as important in their place as the work itself. By understanding something of these various attitudes and feelings, one can discover how far one can go and what are the best methods to adopt for oneself. Then, one goes forward, and through study applied to experience, through experience applied to theory, continues the circle. Finally, one finds that in studying the subject, and then applying it to one's work, that the work has improved, and, at the same time, the knowledge of a subject has been gained.

Mr. Packer said he was privileged to extend to the members of the Manchester Section of gas salesmen a hearty welcome from the salesmen of the West Riding area. He felt that it was time the salesmen throughout the country became acquainted with each other in some other way, in addition to being introduced through that magnificent monthly paper the "Gas Salesman." If these combined meetings could be continued, success would favour them. They regretted that the Chairman of the Manchester Section, Mr. Sillitoe, the Secretary of the Manchester Gas Department, had been unable to be with them. They all knew how whole-heartedly and with what great enthusiasm he had thrown himself into this great movement for the benefit and development of gas salesmen throughout the country. His (the speaker's) second duty was to express some measure of appreciation to Messrs. Wilsons & Mathiesons for the magnificent way in which they had entertained and interested them that day. (Applause.)

They had with them two gentlemen, among

bers, who were an absolute credit to the gas dustry—Mr. Mathieson, the Chairman of essrs. Wilsons & Mathiesons, and Mr. James ilson.

Mr. Packer said that, as he went rough the foundry and the Carlton Works, felt that here, at any rate, was a great firm ho seemed ready from beginning to end to more interested in human beings than in ods. The time had come when only the firms ho could centre their general interest on the ople who worked for them would make headay in the commercial world. When this enomenal interest was combined with a high uality of production, and with extreme care the elimination of all faults in manufacre, then, he thought, they had got a firm ith the best qualities it was possible to have. He had pleasure in moving that their best thanks be given to Messrs. Wilsons & Mathiesons.

Mr. CHRISTIAN (Southport) said that the Lancashire Circle were at a disadvantage in the fact that their Chairman, Mr. Sillitoe, and their Vice-Chairman were unable to be present. Speaking on behalf of the Lancashire Circle, he thanked Mr. Packer for the cordial welcome. He also had great pleasure in seconding the vote of thanks to Messrs. Wilsons & Mathiesons for the very pleasant and particularly generous manner in which they had entertained them. They had thoroughly enjoyed the visit to the works. They had learnt many things, and to his mind one of the greatest assets of a salesman was to know thoroughly the apparatus which he offered for sale. Not only was it essential for him to know his customer, and to have that confidence about which Mr. Jones had spoken so ably, but it was essential to know the appliances.

Mr. MATHIESON, replying to the vote, said it had been a great pleasure to entertain the salesmen. Salesmen should have some knowledge of the manufacture of gas stoves, as well as their sale. Whatever they had learned by visiting the works would, he hoped, help them in their day-to-day work. Salesmen should have tact. It would be of great assistance to the manufacturers if they were acquainted of any complaints regarding their apparatus, so that they might investigate the cause. The firm of Wilsons & Mathiesons would welcome any complaints they might like to lodge.

Mr. WILSON also replied.

Southern District—Kent Area.

A Meeting of the Circle was held on hursday, April 23, at the offices of the unbridge Wells Gas Company—Mr. P. ickering presiding.

Mr. CHARLES F. CATT, the Secretary of he Tunbridge Wells Gas Company, informed the Circle that the Company were leased to have the members of the Circle s their guests. He said that his Chairman regretted his inability to attend.

The CHAIRMAN thanked Mr. Catt for his elcome and made a few remarks on the orthcoming Wembley meeting, saying hat he hoped a large number of the members of the Circle would be present.

EFFICIENT FITTING STAFF AS AN AID TO GAS SALES.

By ERNEST J. PENN, of Tunbridge Wells.

In introducing this subject, I propose to confine myself to the district fitters, as the training of these, to my mind, has been rather neglected in our industry.

Much importance has been attached to the improvement of the salesman, but too little attention has been given to the need for a well-trained staff of fitters. It is upon these employees that the success and reputation of a gas undertaking largely depends; and it is highly necessary that they should have a thorough knowledge of all fittings and appliances, and be capable of answering intelligently any questions concerning them, as lack of knowledge is often responsible for loss of business.

It must be remembered that a great number of consumers never pay a visit to the showrooms, and the fitters (with the exception of the meter inspectors) are the only employees of an undertaking with whom they come into personal contact. Who then has a better opportunity of pointing out the advantages of the use of gas, and the various appliances, than have the fitters? Something, therefore, should be done to give them the training that will enable them to give that service to the consumer which is so necessary to further the success of the industry.

Competition was never more keen than it is to-day, nor was the demand for excellence of workmanship greater; and it is most important, if we are to compete successfully with our competitors, that the standard of work employed should be of the highest. The best apparatus, whether for heating or lighting, can be robbed of many of its good qualities, and cannot be expected to give satisfactory results, if not properly fitted and adjusted; and we must bear in mind that it is where these unsatisfactory results repeatedly occur that our competitors are afforded an opportunity of creeping in.

Though the gas industry has made such rapid strides in the last few years, there still exists in the minds of some a prejudice to the use of gas; and a well-trained workman can do much to overcome this prejudice by making all work successful, and giving confidence and general satisfaction.

While working in a house a fitter may be approached by the consumer with reference to additional fittings or apparatus; and if he is able to satisfy the inquiries, instead of having to refer them to the showroom salesman, or to ask the inspector to call, he may there and then take an order which, for lack of immediate attention, may otherwise be lost. Complaints are often received which, upon investigation, are found to be due to apparatus or fittings that are old and worn out; and the fitter should be capable of pointing this out, and explaining the need for new appliances. In this way he not only lessens the number of complaints, but aids further sales and keeps the consumer's confidence, whereas repeated complaints tend to militate against the best interests of the gas undertaking.

Nothing is more detrimental to any undertaking's reputation than work which is faulty and badly done, while, on the other hand, a finished job which gives satisfaction stands first as an objective that leads to new business.

We need men who are efficient in all branches of fitting work. The custom of keeping one man for one job I consider is wrong, and occasions repeatedly arise when this is not practicable. This may be done if the size of the fitting staff permits; but a fitter should nevertheless have a good all-round knowledge, and be able to perform satisfactorily any job that he may be called upon to do.

We cannot, therefore, under-estimate the importance of giving to the fitting staff the training that is so necessary to further the interests of the industry; and the question now arises: "What can be done, or what is being done, to encourage the men to gain this knowledge?"

A good method, and one which is practised in some towns, is the holding of periodical meetings and discussions. This is particularly beneficial to the older fitters, as it enables them to become acquainted with the working of up-to-date apparatus. But we must not lose sight of the fact that the junior fitters and assistants of to-day are the fitters of to-morrow; and it is upon these that the progress in the future largely depends.

Some of the larger gas undertakings have made it compulsory that boys entering their service should attend classes of instruction in gas fitting, while others, in towns where there is a technical institute, have arranged evening classes for the benefit of their fitters. The latter system was adopted at Tunbridge Wells in 1923, and has so far proved very successful. From October until April two classes are held each week for instruction in the various branches of gas fitting; one lesson of two hours' duration being devoted to practical work, and the other, occupying one-and-a-half hours, for lectures and drawing.

This session 15 candidates enrolled, and the average attendance has been 13, thus showing that the interest and attendance have been well maintained. At the end of the session the students sit for the County Examination in Gas Fitting, and the following is the synopsis of the course of instruction:

Properties of Gas, and modes of distribution.

Governors.—Description of, and method of working.

Services.—Definition of, and sizes necessary for probable consumption.

Meters (ordinary and automatic).—Construction and working; points to be considered when fixing. Reading indices.

Gas Pipes and Fittings.—Uses of iron, lead and compo, copper and brass pipes and fittings; blown, screwed, and flanged joints.

Switch Lighting and Burners.—Description and construction of various types. Adjustments.

Gas Fires, Radiators, and Cookers.—Methods of fixing, regulation of gas and air.

Geysers.—Construction and working, methods of fixing, ventilating flues.

Gas Circulating Boilers and Thermostats.—Description and working. Methods of connecting to existing installations.

Ventilation.—Methods of ventilation by gas.

The foregoing will, perhaps, give some idea of the way in which the subject is treated.

Attendance at these classes is voluntary on the part of the men, but every encouragement is given to induce them to become proficient in their work.

The students' fees payable to the Technical Institute are paid by the Tunbridge Wells Gas Company, provided they register 80 p.ct. attendances, and sit for the examination.

I think you will agree that, if this matter was taken up more seriously by all gas undertakings, our industry generally would benefit greatly, and any extra expenditure that might be entailed for this important and very necessary instruction would be amply repaid by having more capable and efficient men around us, and the attainment of generally better results.

Tea was kindly provided by the Tunbridge Wells Gas Company.

It was decided to hold the first meeting of the next session at Dover.

Mr. PICKERING proposed a hearty vote of thanks to Mr. Penn for his paper, and also to Mr. Catt for all he had done to make the visit of the Circle a success.

Mr. KENNETT (Margate) seconded the proposition.

Mr. CATT and Mr. PENN responded to the vote of thanks.

Mr. WICKS proposed a vote of thanks to Mr. Pickering for presiding at the meeting, and also for his past services as Chairman of the Circle, pointing out that Mr. Pickering had carried out his duties in a most efficient manner.

The proposition was seconded by Mr. COLEMAN (Ramsgate), and carried unanimously.

Mr. PICKERING thanked the members for the support they had given him while in the chair.

The Secretary was also thanked.

Industrial Salesmen's Circle.

A meeting of the Circle was held at Birmingham on Friday, June 19.

During the morning about seventy members of the staffs of gas undertakings in this country visited the demonstration rooms and industrial research laboratories of the Birmingham Gas Department; the shops for the heat treatment of metals at the Windsor Street Gas Works; and also the works of the Moss Gear Company of Aston. The party had luncheon at the Imperial Hotel, and the afternoon was devoted to a consideration of brief technical papers of great practical interest.

The party were received at the Birmingham Council House by Mr. A. W. Smith, the General Manager and Secretary of the Birmingham Gas Department, who accorded to them a cordial welcome.

Demonstration Rooms.

In the demonstration rooms the party inspected a complete range of natural-draught gas heat-treatment furnaces of various makes, of which one or two were shown under fire; a gas and air-blast furnace for high-speed steel and general tool hardening; double and treble cased japanning stoves; jewellers' furnaces for melting, annealing, and enamelling; and a large number of low and high pressure gas-heated soldering-iron stoves. An oxy-coal-gas cutting machine was also demonstrated under practical conditions, together with a special form of furnace for the heat treatment of needles and similar steel articles without scaling.

Research Laboratories.

The visitors also inspected the main research laboratories at the Council House, including the strength of materials, the physical, and the mechanical testing laboratories, and the pyrometer testing and metallographical sections. Compression tests were conducted upon a 100-ton machine, and the party showed much interest in the various tensile, impact, hardness, and physical tests on material. A new method of hardening special tools was also outlined.

The Moss Gear Company.

After leaving the Windsor Street Gas-Works, where the heat-treatment shops claimed much attention, the party proceeded to the works of the Moss Gear Company. There they saw the heat treatment of motor gears being carried out on most scientific lines. All the heat-treatment shops are equipped with the latest types of gas-heated furnaces of the recuperator type. The work of this new form of recuperator was fully explained, and figures were given of gas consumption, showing a considerable improvement on the older furnaces.

Business Meeting.

At the afternoon meeting the chair was occupied by Mr. Stephen Lacey, B.Sc. (Chairman of the London Circle).

Mr. A. W. Smith observed that, though he had formally welcomed them to Birmingham, he desired again to say how delighted they of the Birmingham Gas Department were that the Circle were paying them this visit. Birmingham was often spoken of as "The city of a thousand trades;" and it was possibly because of its diverse trades that the Gas Department's attention had been focussed, more than in most undertakings, on the uses of gas for industrial processes. The industrial laboratories of the Gas Department had been in existence about sixteen years as a separate unit of their activities, but even prior to that, considerable valuable work had been done, particularly, of course, in the use of gas for motive power by their fittings department. The early experiments of the Department in the use of gas for industrial heating purposes proved that gas-fired furnaces could be economically used to a greater extent than had hitherto been done. Sixteen years ago many furnaces were crude; and gave comparatively poor results. It was recognized that greater headway could be made with furnaces designed and constructed on more scientific principles. New designs were accordingly prepared, and the Gas Committee decided to establish a separate section for pushing the sales of gas-fired furnaces and similar apparatus. A demonstration foundry and heat treatment shops were provided where furnaces of large capacity were demonstrated to interested manufacturers, and a separate showroom was established for the display of industrial apparatus. The success of this policy was almost immediately indicated in the increased quantity of gas which was used for industrial heating purposes. Like most industrial areas, they had, of course, their boom years during the war, and well over 30 p.ct. of their total gas was taken for heating purposes and motive power in industry in those years; the highest point being reached in the year ended March, 1919—namely, 35·12 p.ct. In the year ended March last 3541 million c.ft. were used for industrial purposes, being 27·98 p.ct. of their total consumption. In the design and development of the furnace side, it was found essential, continued Mr. Smith, to establish metallurgical laboratories to assist in solving the many problems which had to be overcome to meet the requirements of manufacturers. With those laboratories working in connection with the heat-treatment shops and foundry, a large amount of pioneer work had been done in the development of industrial heating plant suitable for dealing with the numerous processes carried on throughout the Department's area of supply, which covered not only the City of Birmingham itself, but the two large industrial Boroughs of Wednesbury and Darlaston. Their able Engineer in charge of that section of the activities (Dr. C. M. Walter) had no doubt given particulars of some of the typical problems they had been called upon to solve, including research work in connection with the heat treatment of steel used in the manufacture of aircraft and in many other directions. In fact, during the war the laboratories were almost the home of Government inspectors in connection with aircraft work, shell production, &c. The Birmingham Gas Department considered it an honour that their laboratories were recognized now by certain sections of the Air Ministry for the testing of materials used in connection with aircraft, and a considerable amount of work was carried out from time to time for other departments of the Government. The Board of Trade had granted permission for a special test mark to be used in connection with the certification of tests on materials carried out in the laboratories. Gas had been adopted by many local firms for the heat treatment of metals, including carburizing, hardening, tempering, annealing, as well as the melting of metals and alloys and the firing of enamels and ceramic ware. Mr. Smith apologized for the absence of the Lord Mayor (Alderman Bower), and the Chairman of the Gas Department (Alderman Lloyd). They asked him to say they hoped the Circle would have a successful and instructive meeting, and leave Birmingham with pleasant recollections of their visit. "There is no doubt in my mind," added Mr. Smith in conclusion, "that we have to look more than ever for future development of the gas industry to the cultivation of our industrial load; and though at the moment almost every undertaking in the country is faced with the necessity for increased prices, owing to a slaughtered residual market, this is but a passing phase, and it behoves us to work all the harder to increase the efficiency of the furnaces we are installing, and retain the goodwill of our consumers." (Applause.)

The Chairman said he was very interested to hear that 28 p.ct. of the total output in Birmingham was used for industrial purposes. This fact indicated the scope of the work, which was open to them all. He thought their visit to the industrial showrooms and the research laboratories would be a source of inspiration, and that they would return determined to make a renewed effort to increase their industrial load. With regard to the latter, they were looking to the heat-treatment of steel; and many of them were surprised to find that at the Moss Gear Company's works American tools

ere used. They were given to under- and that those high-speed tools could not made in England. He mentioned this atter to Dr. Walter, who had expressed e hope that in a short time they in his partment would be able to make those ols.

Dr. WALTER observed that the point had isen at the Moss Gear Works with re- ard to a special form of hob and gear tters for the machining of motor-car les. He thought it would be interesting them to know that they could without fficulty produce equally satisfactory re- lts in this country. Tools were being oduced in America in greater quantities an in this country; and their methods heat treatment were carried out on ghly scientific lines. They had an oppor- nity of witnessing a demonstration of e decalescent indicator, by means of hich could be determined the proper tem- eratures to which different grades of eels should be heated before being uenched for hardening. In America, ols of the kind under consideration were eat-treated by what was known as the ump method, which, in effect, was no- ing more than the application of the de- alescent indicator. Instead of worrying bout temperature and the like, they could ave the question to this sensitive instru- ent, which was claimed to be accurate to ithin 0·5 p.ct. The operator had simply o follow his record until the decalescent oint was reached, and then he knew that ne carbon in the steel had gone into solu- on, and proper results would be obtained y quenching. The matter was carried a tage further by the taking of micro- hotographs of the steel. Those were asted on the recorder chart, and the deca- escent point, or hump, as it was often alled, was traced over the micro-photo- raphs, so that one was thus able to find hat grain size was required for a particu- ar article. One simply picked out the oint upon the curve which corresponded o the photograph on which the curve was rawn; and the results could be repeated ith mathematical precision. Many of the ools from America had been treated by lectrical heating; but in Birmingham heir experience was that, with larger ools, the cost was too high. There was no doubt that the work could be done equally atisfactorily in this country.

SOME USES FOR GAS IN PRINTING WORKS.

By J. ENNALS.

In the time at my disposal it is impos- ible for me to touch upon all the numer- ous processes connected with the printing rade. For instance, I do not intend to deal with the production of pictures, pro- ess block making, and stereo-metal making and refining, each of which, in itself, would form a subject for a paper.

In London, so far as printing is con- cerned, our principal field lies in the pro- duction of newspapers and periodicals. Some provincial newspapers may not, at present, be ready to consider converting from solid to gaseous fuel, but it may interest you to know that the following London newspapers and periodicals use gas for melting stereo-metal in bulk—*i.e.*, in 7-ton metal pots: "The Times," "Daily Mail," "Daily Mirror," "Daily Telegraph," "Daily Chronicle," "Daily Express," "Morning Post," "Daily News," and "Punch."

A number of printers producing small periodicals also use gas for smaller pots.

In describing the processes, I will fol- low the various stages of production from compositor to the publishing or distri- buting department.

Lino. Slug Pot.—In this the ingots of stereo-metal, received from the foundry, as well as the used lines of type, or slugs, are melted and run-out into small ingot moulds, measuring about 4 in. by 2 in. These are a handy size for feeding the linotype machine, where the pot is com- paratively small, holding about 200 lbs. of metal.

Linotype Machine.—The linotype com- positor operator, working on a keyboard closely resembling that of a typewriter, sets-up the lines of type for the news columns. Picture-making is dealt with in another department, where gas rings and burning-in stoves are used in the produc- tion of zinc negative plates from the posi- tive photographic prints. The burner under the linotype machine metal pot uses about 12 to 15 c.ft. of gas per hour, and is controlled by a thermostat adjusted to operate at about 600° Fahr.

It may be well to mention here that one or two electrically-heated linotype metal pot heaters are now on the market—one I have seen is made by a French firm of manufacturers. The cost of this equip- ment, however, is high; somewhere in the region of £20, as against about £3 for the gas burner and thermostat.

A small jet plays on the throat or nozzle of the pot to prevent this becoming cor- roded with metal.

The made-up news lines are next set up in steel frames in page form, with or without picture blocks, as required. An impression is obtained by pressing or mangling wet papier mâché on to the type in the steel frame. This substance is known as flong, and consists of several thicknesses of specially-prepared paper pasted together to resist any tendency to crack.

Steam Heated Press.—The impression is then passed—still attached to the type setting—to a press, the under-side of which is heated by steam at a pressure of about 80 lbs. per sq. in. It is then allowed to dry down while still in contact with the type; the flong thus setting into what is known as a matrix, or mould. The older type of steam generator and press is self-contained; the steam genera- tor being fitted under the press. Gas- fired boilers, fitted away from the stereo room, capable of heating eight presses, are now superseding the older type.

Patching-up Hotplate.—The matrix at this stage has to be patched-up at the back with stiff pieces of cardboard to resist the pressure of metal while in the casting box, as described later. This patching-up is done on a hotplate about 3 ft. by 2 ft., heated by 3-bar bunsen burners.

Matrix Dryer.—When dry, instead of wet, papier mâché or flong is used, after the impression is made the matrix is placed in a matrix dryer to extract any degree of moisture, and to bake or fix the impression. The dryer has a rotating cylinder fitted inside, which revolves over 2-bar bunsen burners. The matrix is next placed in a chamber to preserve the half- round shape, and to keep it warm until it is required for the casting machine. Better castings are obtained by this pre- heating. The drying drum is rotated by a belt drive from shafting, or by a separate motor attached to the base.

Combined Auto-Plate Furnace and Cast- ing Machine.—This is our best "cus- tomer." The metal pot contains about 7 tons of stereo-metal, which is raised to a temperature of 640° Fahr., for casting operations. Usually more than one plate is made from each matrix, in case of damage either in transit or while the plate is actually on the printing machine. The weights of these plates vary according to the size of pages required. "The Times" plate is cast at 60 lbs., from which a tail weighing 20 lbs. is cut. This tail is neces- sary to ensure a good packing of the cast- ing box, with the result that a good plate is produced.

The plate, after having the edges cleaned-up, is next taken to the machine room ready for affixing to the rotary rollers on the printing press. A method of firing the furnace which has recently been found to be highly satisfactory is by the use of gas and air blast burners fixed hori- zontally to the pot, the flames impinging on a base of refractory material beneath it. This base becomes highly incandes- cent, and the heat is deflected evenly over the whole of the bottom. It is found that this is an improvement over the older method of vertical burners, with flames impinging directly on the pot.

Oxidation of metal and pitting of the pot is reduced to a minimum, since the flame does not actually make contact therein.

It is good to see that Mr. Brooks, the Gas Light & Coke Company's Technical Adviser, is with us, as he will probably be able to give us his opinion on both old and new methods, since he has installed both types for London daily newspapers. I think I can safely say that the new method has been found to be a distinct improvement. British Furnaces, Ltd., have also installed this type in several London newspaper foundries. The main burners are of ordi- nary town pressure gas, and air blast at about 1 lb. pressure, burning about 1200 c.ft. per hour when full-on for casting. Two or three natural-draught stand-by burners are fitted which are kept alight when casting is not being carried out, and which maintain a temperature of about 500° Fahr. These burners use from 150 to 180 c.ft. per hour.

It is common practice in London to keep these standy-by burners going all day until the casting begins for the next day's run. By this method the metal can quickly be raised from 500° to 640° Fahr. for casting, and the danger of cracking a pot is eliminated. The latter may result if the metal cools down sufficiently to form a hard crust at the top of the pot. The contents of the pot are never allowed to run below 7 tons. As plates are cast, used, or in some cases fresh, ingots are put in to replenish the molten metal.

The advantages of gas over solid fuel are many. For instance, between the editions of papers the whole of the bat- tery except the stand-by burners can be turned out. When solid fuel is used, it has to burn continuously and the metal also stands in danger of being overheated, unless carefully watched.

A new type of casting machine recently installed for the "Daily News" has a furnace capacity of only 2½ tons of metal, but is capable of casting at the rate of three plates a minute. The machine is made by Winker, of Berne, Switzerland; and we may hear more of this in the near future. The consumption on this machine is only 600 c.ft. per hour, when casting.

An important point when converting any solid fuel furnace to gas is to recon- struct the interior arrangement of brick- work between the outer casing and the pot, in order to restrict the passage of heat to the flue. An adjustable baffle should also be fitted to the flue vent, capable of being nearly—but not quite—closed when the furnace is "lying down," or when stand-by burners are in use. Much heat will be conserved in this way by a careful operator, who can soon become used to its manipulation. I stress these points as being likely to be deciding factors regard- ing the success of failure of an installa- tion.

Gas-heated Glue Pots are used in the machine room for various processes con- nected with the paper roll when starting up, making up, and patching.

Black or Metal Cleaning Pot.—In some print houses the used plates are run-down and cleaned-off in a black pot, so called because the ink is burnt-off in melting. Fresh ingots are cast from these for placing in the auto-plate, instead of feed- ing it with old plates in their dirty condi- tion. These "black pots" (ranging from one to three tons' capacity) are in most cases gas-fired by natural-draught burners.

Some smaller printers work with fur- naces of from one to three tons capacity, the latter having a pump feed to portable casting boxes, while with the 1-ton size

hand ladles are used instead. Many of these smaller type of furnaces are still fired by coal or coke.

By the installation of gas, floor space is saved. We were recently called in to substitute gas for coal for a 2-ton Hoe furnace in a printer's foundry. The conversion was satisfactorily carried out by natural-draught burners; and in the space formerly occupied by the coal bunker (about 8 ft. by 3 ft.) the printer was able to erect an extra machine to deal with the cleaning-up of the plates.

Monotype Machine.—This machine has a gas-fired metal pot very similar to that fitted to the linotype machine, and is used principally by trade typesetters, a good many of whom exist in and around the recognized printing areas of London and the larger cities.

The processes mentioned are the principal ones in which gas is used, but there are many other opportunities, among which I may add:

Rule-Casting Machine.—Job printers make a practice of casting their own rules or line spaces (flat metal strips) as and when required, since a great variety of thicknesses is needed. The rule-casting machine is capable, by adjustment, of producing, without delay, rules of any desired thickness, which is a matter of prime importance to the jobbing printer. The metal pot is heated by gas, as also is the delivery throat from which the cast rule is drawn. The delivery end of the throat is water cooled.

Type-Casting Machine.—This machine is also favoured by the jobbing printer, though it is sometimes found in the works of the larger publications. The object of this machine is to provide letters or characters of certain kinds of which the compositor is running short. A die of the character or letter required is placed in the machine, and type is produced at a rapid rate to make good the shortage. The metal pot is heated by a natural-draught burner. Ink ducts on "Wharfedale" and "Fleet" machines are warmed in winter, to ensure a good flow and to prevent the inking rollers from becoming too tacky. A method of carrying this out is to fix a saw-cut bar burner, with a low flame, at a distance of about 18 in. from the machine-board level, at the feed end. Experiments of this type were recently carried out a large London works, with highly satisfactory results, on machines printing cheques for most of the leading banks.

Hot Water for Hand Washing.—Machine-room hands, stereotypers, and compositors must be provided with facilities for washing, and the water must of necessity be hot. Gas water heaters of either the storage or instantaneous type should find a place in any well-equipped works. Many, indeed, are already in use; the reliability of the supply being greatly appreciated by the staffs employed.

Boiling Water for Tea Making.—As a good deal of the work in the production of a daily newspaper takes place at night between the hours of 10 p.m. and 4 a.m., when there are few facilities for liquid refreshment, provision is usually made for making tea on the premises, by the installation of gas-fired boiling water apparatus, for which there is a growing demand. The day staffs also have their needs attended to by the installation of grills and dinner-warming ovens.

I have not dealt with the processes connected with electrotyping and process block making for high-class illustrations, as space will not permit. This side of the business of printing is usually carried on by works which specialize in it, and should be dealt with in a separate paper.

The outstanding advantages of gas over solid fuel in the printing works are as follows: Cleanliness, ease of heat control, no man-handling of fuel or removal of ashes, saving of labour and floor space, speed with which first heats can be obtained, healthier working conditions, no danger of overheating metal, and no anxiety as to supply of fuel during transport strikes.

We in the gas industry have very good reason to feel justly proud in the knowledge that gas plays such a big part in the production of our daily papers. I have set out matters coming within my own knowledge, but should like to hear a discussion on the subject, and to gain further experience from others who have dealt with gas matters for printing and publishing firms.

Discussion.

Mr. B. W. BROOKS said that in London they were advocating low-pressure gas in preference to high-pressure. Where time was the chief factor, air-blast came in.

Mr. A. B. ROXBURGH (Newcastle-on-Tyne) inquired into the difference in consumption as between direct contact with the plate of the heating or refractory material.

Mr. BROOKS replied that, with the old-fashioned system, for every cubic foot of gas consumed, 4 lbs. of metal were cast; under the new system they had increased the quantity of metal cast to 6 lbs. per c.ft. of gas.

Mr. ENNALS said he had no actual figures as to cost, but on one London daily it was said that, all factors considered, gas was nearly as cheap as the solid fuel, but the great saving lay in the economy of floor space.

Mr. J. C. WALKER suggested that there should be a very big market for gas engines in printing works, where reliability was essential.

Mr. ENNALS remarked that though a general failure of electrical supply would bring a printing house to a standstill, some newspapers got their power from as many sources as was possible.

Mr. W. M. MASON ("B.C.G.A.") said the Glasgow Corporation Gas Department were able to keep the "Glasgow Herald" going during a coal strike. This was a valuable point from the publicity aspect.

Mr. E. L. OUGHTON (South Suburban) said there was difficulty in getting a good thermostat.

Mr. ENNALS pointed out that thermostats were supplied with the monotype and the linotype machines when they were set up.

THE APPLICATION OF GAS TO SHIP REPAIRING.

By J. M. LOUGHLAND.

The subject of my paper is a very big and important one, and the time at my disposal very short. My experience of this work on a large scale commenced when the British Commercial Gas Association advised my Company that Messrs. Harland & Wolff, Ltd., of Belfast, were about to erect extensive shops to be equipped for the repair, reconditioning, and redecorating of ships, lock gates, cranes, cold storage plants, &c., on a site adjacent to the commodious King George V. Dock, North Woolwich, which had just previously been opened by H.M. the King.

The London Manager at my first interview indicated that very little gas would be required, it having been arranged to carry out most of the heat-treatment processes with hard fuel or electricity. However, by persistent effort and the presentation of practical and instructive data, we were eventually able to convince his Company to such a degree that special plant was devised to carry out processes, which it is my pleasure to introduce to you today. Gas is supplied to these works by an 8-in. cast-iron main, passing through a wet meter of 40 therms per hour capacity, and is distributed by means of 8, 6, 4, 3, 2, and 1 in. supply pipes.

BOILER SHOP.

The most important process our special furnace department undertook was the heating of front-end and back-end boiler plates for flanging, which, as far as could be ascertained, had not previously been accomplished with town gas in this country. The plates naturally vary according to the size of boiler from 16 diameter down to 10 ft. diameter, from 1⅛ in. to ⅞ in. in thickness, and part to be flanged must be raised to temperature of 1500° Fahr., or bright heat. It is then placed in the hydrau press, and pushed over into shape.

The heating of these plates is done three distinct processes, and a furna had to be constructed for each of these

For furnace-openings and sludge hol the whole of the portion of plate to flanged is heated in one operation; in the case of the outer flange, which h to be bent in sections of about 6 ft., it w difficult to construct a suitable furnace, provision had to be made for that porti of the plate which is already par flanged.

The furnaces are constructed of hea angle iron with ¼ in. plate panels, a lined with Stourbridge firebricks. No. is heated by 51 gas and air-blast burner with separate control valves to sections 6 or 8 burners, for adjustment of flam and to cut out those not required for small plate; and the consumption is 12 therms per hour. No. 2 has 4 burner each separately controlled, with a co sumption of 7·5 therms per hour; and N 3 has 20 burners consuming 3·5 therm per hour. Gas is supplied at approx mately 4 in. water-column pressure, ar air-blast from Keith and Blackman No. "S" type high-pressure air blower 10 in. water-column. These furnace have so far proved to be very satisfactor and have many advantages over othe methods of heating the plates, which w previously carried out in hard fuel fu naces with forced draught. The temperature in all parts of our furnaces is unde control, which eliminates the risk of loc overheating, burning, and pitting plates, and underheating, with resultan splitting when bent in the hydraulic pres I regret it is not possible to give you som figures appertaining to the efficiency o these furnaces, as they have only recentl been installed, and we have not yet ha the opportunity of actually testing the in operation.

We also fixed in this shop five larg rivet heating furnaces, made by our cou sumers on the same principle as those used in one of their works. These are fitted with gas and air-blast burners and controls by British Furnaces, Ltd. The heating of rivets for any work is very im portant. A bad rivet in a boiler is a mos serious matter, and may lead to a bad accident if it has been burned, pitted, or scaled during the process of heating, and it has been proved by experience that the use of gas for this process obviates all dangers of this nature.

TINSMITHS SHOP.

Our furnace department also constructed a tinning bath furnace, fixed in the tinsmiths shop, for re-tinning copper cooking utensils usually used on big ships. We also fixed twelve Keith and Blackman high-pressure soldering-iron stoves, and converted a 100-gallon tank—previously heated by steam coil—containing caustic solution for cleaning of apparatus to be repaired. The heating of this tank by steam was unsatisfactory, as it was not possible to clean out the sludge which fell to the bottom around the coils. Natural-draught burners were fitted beneath this tank, with very satisfactory results.

COPPERSMITHS SHOP.

An 80-gallon bitumen cooker was installed in the coppersmiths shop, fitted with a hard fuel furnace, to be used for melting pitch to load large copper tubes before bending. It was pointed out that there would be a great loss of time in lighting-up a furnace of this character, particularly in an emergency job when the coppersmith had prepared a pipe for bending. With irregularity of temperature also, the pitch may burn, and great diffi-

y may be experienced in filling the pipe properly melting-out the pitch when bending had been accomplished. The antages being so great in favour of n gas, we obtained instructions to con- this apparatus. A natural-draught ner was fitted, and the ventilation red to get the highest possible effi- ıcy from the gas consumed. Blast vpipes for brazing were also fitted in shop, and have proved to be the best sible heating agent for this work, as t can be directed exactly where re- red, and the spelter made to run where ıted, resulting in a perfect braze. ıas-heated tanks, a copper, a sawdust ing pan in the platers shop, and two ge japanning ovens in the japanning p were fixed, all of which processes re re exact regulation of temperature, ily obtained by gas.

know you will be glad to learn that were able to render service to the elec- ians by fitting natural-draught solder- -iron stoves, and also burners for ing-out armatures.

ENGINEERS AND TOOL SHOP.

, Richmond oven furnace, 24 in. wide 9 in. high by 30 in. deep, and a John ight high-speed steel furnace with two umbers 8 in. by 8 in. by 8 in. were ed in the tool shop, for case-hardening, ıealing, and hardening tools, &c. They supplied with gas at approximately n., and air from a Keith Blackman wer at 8 in. water-column pressure, l are giving every satisfaction. Our nace department constructed a special -blast burner for expanding a liner in. in diameter by 20 ft. long by 1⅛ in. ck. It was so made that heat was ap- ed to the liner from inside; and, being table, the gas and air connections were de with armoured hose-pipe. In order t the burner may move freely at will, l the heat may be directed where re- ired, a wheel was fitted on the bottom, l a handle fixed 10 ft. long, made of n. barrel. The liner was set-up in a rizontal position in a cradle, and turned that the heat was evenly distributed. sting for the right temperature was ne by means of sticks of tinmen's solder, ich, when brought into contact with outside of the liner at the desired tem- rature, quickly melted. This liner was banded and shrunk on to a tail-end ppeller shaft under one hour, and the nsumption of gas was not quite 5 erms. From this experience it was de- led to alter the method; and the next e was set up on end in a pit, and heated means of natural-draught burners en- cling the outside of the liner every 2 ft. om the bottom. The metal readily took the heat; and therefore uniformity of stribution was accomplished. When the ıer was sufficiently expanded to take the aft, which, by the way, weighed about ght to ten tons, the latter was lowered to position by the travelling crane. This ethod was more satisfactory, and has en finally adopted. We also fixed a onometer metal-melting furnace for ating metal to run in bearings, and a rnace supplied by the same makers for covering metal from old electric cable d wire returned from ships. These are th giving satisfaction. In the foundry e fixed two powerful blast blowpipes ed by the moulders for drying purposes. here is no canteen in these works, but ree "C" type Jackson water heaters, ch with two taps, capable of supplying pints of boiling water per minute, were ted in different parts of the works to pply hot water for tea making. We are w making natural-draught burners to at a tank containing approximately 400 llons of caustic solution for cleaning linders and parts of engines to be re- ired.

CHAIN ANNEALING.

It is a Home Office Order that a re- ster must be kept of all crane and sling chains, lifting gear, &c., also that they should be periodically examined, annealed, and tested, as precaution against accident due to fracture. The method of carrying out the process of annealing chains, &c., in this country, is to build up the chains in layers of wood, which is fired, and the chains left to cool down in the ash, or to heat them in a wood-fired furnace. This was the practice at our Beckton Works, and crane chains of 1-in. rod link, 400 ft. long, took three men several days to anneal, as only portions of it could be dealt with at one time, and then it was a question as to whether every link had been properly heated.

A specially constructed gas furnace to carry out this process was made by our furnace department and fixed in these works. This will perfectly anneal a similar chain in six hours with the assistance of one man to see that it enters the furnace freely, and to guide and pack it into a steel tub when it leaves.

When the annealing is completed, the tub is covered up and left to cool down in its own heat. The furnace is fitted with a pulley, which is driven by a ¼ B.H.P. motor, to draw the chain through at the rate of just over 1 ft. per minute. It is also fitted with seven gas and air-blast burners, each separately controlled, and can be adjusted to the desired temperature and size of chain being dealt with. The burners are fixed in the top of the furnace, and the flame directed on to the floor. The products are drawn off through ports at the side, and thence into two flues. The consumption is 3·5 therms per hour full on.

Our Chief Mechanical Engineer informed me that this system, which has been used for two years, is very satisfactory, and much better than the previous process.

I regret that this paper does not contain more data as to the comparative cost of gas compared with other fuels, which I may have the opportunity of giving at some future date.

Discussion.

Mr. NOEL SMITH (Greenock) stated that in Greenock they had gone very deeply into the question of converting frame and angle furnaces from producer gas to town gas. At present, with the bottom out of the coke market, town gas would need to be sold at 4d. per therm to compete favourably with producer gas for this class of work. The Greenock price was 4·25d. per therm. Much better results would be obtained on a furnace specially designed for coal gas. Mr. Smith then put forward the following statement:

Comparative Cost of Working Frame Furnace on Producer Gas and Town Gas Based on an Output of 76 Tons of Steel per Week

PRODUCER GAS.	£	s.	d.
20 tons of coke at 27s. 6d. per ton (includes cartage)	27	10	0
Furnaceman, 47 ordinary hours and 24 hours' overtime	3	3	0
Assistant furnaceman, 36 ordinary hours at 10d. per hour	1	10	0
Discharging coke	0	17	0
Removing ashes	0	10	0
	£33	10	0

Cost per ton of steel, 8s. 9·78d.

TOWN GAS.	£	s.	d.
1927 therms at 4·25d. per therm or 470,000 c.ft. at 1s. 5·425d. per 1000 c.ft.	34	2	5
Furnaceman, 47 ordinary hours and 10 hours' overtime	2	10	0
	£36	12	5

Cost per ton of steel, 9s. 7·64d.

In arriving at the town gas figures, the temperature of 1800° Fahr. was assumed, with a throughput of 40 cwt. per hour. The gas consumption over one week (470,000 c.ft.) is based on the assumption that the furnace would require 6000 c.ft. during the first hour each morning to bring the furnace to working temperature. The actual working time during the week would be 38 hours; and at 40 cwt. per hour represents a weekly output of 76 tons.

Frame Furnace, 75 ft. by 2 ft. 9 in. by 1 ft. 9 in.	2000° Fahr.	1800° Fahr.
Holding at 2000° Fahr. =	1,750 c.ft. per hour	1,500 c.ft. per hour
Two 15-cwt. bars in 15 mins. =	8,500 c.ft.	7,500 c.ft.
From cold start in 3 hours =	45,000 c.ft. total	40,000 c.ft. total
Heating-up in mornings after previous day's work in 1 hour =	9,000 c.ft.	8,000 c.ft.

Conversion of Producer Gas Plate and Frame Furnaces to Town Gas Firing

	Frame Furnace.	Plate Furnace.
	£ s. d.	£ s. d.
Burner equipment, low-pressure system	509 0 0	270 0 0
Air blowing fan direct-coupled to electric motor, 250 v. D.C., complete with starting switch, &c.	115 0 0	115 0 0
Sundry materials	5 0 0	10 0 0
Labour	63 0 0	42 0 0
Pipeline and other sundries	98 0 0	51 0 0
	£790 0 0	£488 0 0

If high-pressure gas were available on the works, a saving of nearly £200 would be effected on the frame furnace, and £150 on the plate furnace.

From this statement it will be seen that, with coke at less than 30s. per ton (at the shipyards), and with gas at 4·25d. per therm, a conversion is not a practical proposition.

Comparison: Gas and Oil Rivet Furnaces.

	Twin Gas-Heated Furnace with Compressed Air Supply.	Open Feed Oil-Heated Furnace with Natural Draught.
Number of hours at work	8 hours	8 hours
Consumption of fuel	6400 c.ft.	48 gallons
Average consumption per hour	800 c.ft.	6 gallons
Cost of gas per hour at 2s. per 1000 c.ft.*	1s. 7d.	Average cost of oil per hour at 5d. gallon 2s. 6d.
Cost of compressed air per hour	3d.	"
Total cost per hour, gas and air	1s. 10d.	"
Average number of ⅝ in. diameter rivets, 3 in. long, heated per hour	500	200
Cost per 100 rivets	4d.	1s. 3d.

* 410 B.Th.U.

More efficient, cleaner, less danger of fire, furnace can be heated up in ten minutes—therefore unnecessary to bring in heater boy before starting time, as in case of oil furnaces—elimination of smoke, elimination of cost of cartage on oil and handling from store to furnace daily—these are among the advantages of gas.

From these figures it will be seen that there is no comparison between the open feed oil-heated furnace with natural draught and the gas-heated furnace. There is not, however, a big difference in actual fuel costs when comparing a modern forced-draught oil furnace with gas, but the over-all advantages are a long way in favour of gas.

Mr. W. M. MASON told the meeting that, as a consequence of sending to Messrs. Harland and Wolff the pamphlet "A Thousand-and-One Uses for Gas," an important inquiry came, resulting in special plant being advised to carry out a process at their new works. All depended on what was done with inquiries. Efficiently handled by efficient men with knowledge, business was bound to come after a time.

Dr. WALTER suggested that it should not be necessary to use air-blast burners in connection with the annealing of chains, as they at the Birmingham laboratories had obtained very satisfactory results with furnaces of the natural draught type, these being particularly suitable owing to the ease with which reducing atmospheres could be obtained in the furnace chamber.

LARGE PIPE BENDING.

By A. B. ROXBURGH.

I am not giving these few details respecting pipe bending in any way as the "best methods," but rather, if possible, to draw out, in discussion, ideas for doing the job better and more economically. Of course it is a trade largely carried out in connection with shipbuilding, and may not have so universal an application as have some other jobs. The pipes dealt with are usually solid drawn, and vary in diameter from 2½ in. to 8 in. Each works seem to have their own particular methods with apparatus that they have constructed for themselves.

It must be remembered that it is not altogether an easy matter to bend an 8-in. pipe to a complicated template, keeping it free from "kinks," drawholes, &c., and at the same time to maintain its full capacity and strength. The usual method is to heat the pipe for the required length in some form of furnace, and then bend it on a cast-iron holed table—the desired radius being obtained by means of iron pegs in correct holes in the table. The pipes, are, of course, first filled tightly with sand.

I was in a works last week where the method employed simply consisted of a blowpipe of home manufacture with a backing-up of firebricks to the pipe; the heating being done on the holed table itself. At some distant date they had constructed castings in holes, and lined with firebrick to encircle the pipe; the blowpipe being used through a suitable aperture. I suppose on account of the little trouble in fixing the arrangement, it had been discarded.

In another and much larger works, the foreman of the shop, who is a "live" man, has constructed a special furnace for each table, and the figures which follow may be of interest.

I may here interpose to remark how difficult it is in many cases to obtain accurate figures of everyday work. A test may have been made some time in the past, and the rest consists of impressions. It says something for ourselves, however, to state that, due to persuading them to adopt a better mixing of the gas and air, and thus shortening the flames, the gas consumption was reduced from 800,000 c.ft. over a period to 570,000 c.ft., and the work was accelerated.

In another large works they have no special furnaces, but just sheet iron sleeves lined with asbestos which they thread over the pipes to be bent. They have arranged gas and air supplies on each of the four sides of the tables for ease in working. No details of costs are kept.

The piping is generally used for high-pressure steam.

In one of the above works they have just solved another problem for themselves—

Results of Tests on Pipe-Heating Furnaces—October, 1924.

(1)	10 heats.		Consumption	2400 c.ft.,	240 c.ft.	per heat	net cost	8·8d.
(2)	9 ,,	1 ft. 2½ in. 1 ft. 4 in. 7 ft. 6 in.	,,	3100 ,,	344 ,,	,,	,,	12·6d.
(3)	12 ,,	9 ft. 3 in. 1 ft. 2½ in. 2 ft. 6 in.	,,	2500 ,,	208 ,,	,,	,,	7·7d.
(4)	10 ,,		,,	2700 ,,	270 ,,	,,	,,	9·9d.
(5)	31 ,,		,,	8000 ,,	258 ,,	,,	,,	9·5d.
	72 ,,			18,700 ,,	260 ,,	,,	,,	9·62d.

The sizes of pipes heated ranged from 2½ in. to 6 in. in diameter.
The time occupied in heating a 2½ in. pipe was approx. 9 minutes
,, ,, ,, ,, ,, 3 ,, ,, ,, ,, 11 ,,
,, ,, ,, ,, ,, 4 ,, ,, ,, ,, 17 ,, (now 15 mins.)
,, ,, ,, ,, ,, 6 ,, ,, ,, ,, 25 ,,

the brazing of copper from sheet to mal large-diameter (often 21 in.) exhaust pipe The metal is first roughly bent to t shape of a pipe, the edges are scarfe brought together, and then brazed—abo 12 in. at a time, until the whole length h been dealt with.

They use two slit burners applied to t underside of the pipe; the spelter and flu being fed in from the inside of the pipe on the top of the joint.

This is, of course, a special purpose jo but it is interesting as being one of th very many adaptations of gas to heating

Discussion.

Mr. BROOKS asked what was the thickne of the copper tubes; and Mr. ROXBURGH r plied that they were 3-16th plate.

Mr. NOEL SMITH asked if the web we heated externally. They had been told, h said, by a firm in his district, that a simil method to that described was not a succes It was found that the shafting became slight slack, and thereafter the method was adopte of putting the web into the oven.

Mr. SMITH, in regard to pipe bending, sai that a Greenock firm had replaced solid fu by oil; their contention being that the latte was cheaper.

Mr. ROXBURGH pointed out that wher work had to be done with an open furnace there was a great objection to the smell an smoke arising from oil. His contention wa that, on cost, gas beat oil, which was a fluc tuating market.

Mr. CAUDWELL pointed out that the autho had spoken merely of bending straight pipes How was a big curve to be dealt with?

Mr. ROXBURGH replied that the pipe woul be placed in the furnace with bricks packe around it. The pipes could be suspended a any angle.

Mr. MARSH then read a paper on "Ga for Power Purposes." This, with the dis cussion, will be published in the next issu of "THE GAS SALESMAN."

Lancashire District—Manchester Section.

A Meeting of the Circle was held at the Corporation Gas Furnace Demonstrating Rooms, Manchester, on Wednesday, May 27—Mr. J. B. Stewart (Rochdale), Vice-Chairman of the Circle, presiding.

An address was given by Mr. Shipley N. Brayshaw, M.I.Mech.E. (Manchester), on "Gas Furnaces."

Mr. STEWART said that Mr. Brayshaw was no stranger to the gas industry, and he (the speaker) considered they were fortunate in having him to speak on a subject full of interest. Gas furnaces played a very important part in industrial operations. Manufacturers were realizing that gas could show efficiencies far greater than any other fuel.

GAS FURNACES.

By S. N. BRAYSHAW, of Manchester.

Mr. Brayshaw began with some reminiscences of his experience with gas furnaces when he started business for himself in 1898. He then proceeded to speak of the accuracy required in the heat-treatment of tool steel; small differences sometimes having a vital influence upon the product. The lecturer advocated heating in liquids wherever possible, because there is a certainty in the process when a liquid is used, which is not attainable by any other means. In an open or oven furnace, you depend upon the judgment of the operator as to whether the work is at exactly the same temperature as the pyrometer; and sometimes the pyrometer reading may be very misleading, because it indicates its own temperature, which may be different from that of the work. On the other hand, if the pyrometer and the work are both in liquid which is kept sufficiently in motion by stirring, you can be sure that, after a short time, they are all at the one temperature, and the pyrometer truly shows the temperature of the work. If a piece of steel weighing 3 to 4 lbs. is cooled from a temperature of (say) 800° to 20° C., it will evidently take a very long time before it is uniformly at 20°; but if it is immersed in a liquid of 20° C., it soon reaches the desired temperature in every part. If the steel is to be heated from 20° to 800° C., the conditions are similar.

The lecturer spoke about the choice of liquid, and pointed out that its suitability is determined by specific gravity, conductivity, boiling-point, fluidity, and specific heat. He said he had tried lead and many other liquids, and advocated the use of suitable mixtures of salts.

Mr. Brayshaw gave some account of the hardening of high-speed steel, and sai that in this case he did not advocate heat ing in a liquid, because of the difficulty o doing so at the high temperature required He proceeded to speak of the injury don to metals through oxidation at a red heat and gave a demonstration of a brigh hardening furnace in which the work i heated to a good red heat in an atmo sphere of coal gas, and the arrangement are such that it is possible to dump the work into oil without its ever coming int contact with the air. After some piece of bright steel had been hardened by heat ing in the furnace and quenching in oil they were found to be as bright as whe they entered the furnace—indeed, it wa difficult to distinguish between the hardened and the unhardened pieces. A still more striking demonstration followe in which pieces which were black with oxidization were heated and hardened and they came out bright. It was ex plained that the coal gas reduced the oxide on the surface of the steel and left the bright iron. Pieces which were black when they entered the furnace were as bright as freshly-polished steel when they came out of the quenching tank.

Mr. Brayshaw showed a gas flow in dicator in connection with a furnace. In dicators are made of various capacities from 500 c.ft. up to 10,000 c.ft. per hour. The gas is made to pass through a throat of an exact diameter, and in the centre of

e throat is a small facing tube which re-ives the full force of the flow of gas, so at a small amount of the kinetic energy the gas is converted into static pressure. n order to eliminate the disturbing in-uence of varying pressure in the gas ain, a connection is taken at the side of ie throat. The two connections are then ken by small diameter pipes to the two des of a diaphragm in the indicator. Thus ie instrument consists of a differential essure gauge which balances the kinetic 'us the static pressure of gas against the static pressure alone. In this way the true kinetic pressure is obtained for a given velocity, as the gas passes through a throat of known size. Thus the velocity, and consequently the volume, may be calculated. The instrument is really a pressure gauge, but the readings show the corresponding flow of gas expressed in the most convenient form. The value of the instrument lies in the fact that the gas consumption as it changes from moment to moment can be seen at a glance without any calculation; and any irregularity in the furnace is discovered at once. In some cases these instruments are used instead of pyrometers, as it is found by practice that certain results can be obtained with definite gas consumptions.

Mr. P. H. Christian (Southport) moved a vote of thanks to Mr. Brayshaw, specially coupling with the vote the names of Mr. W. D. Gulland and his staff.

This motion was supported by Mr. T. E. Richmond (Blackburn), and was carried with acclamation.

Midlands Circle.

By invitation of the Chairman and Directors of the Leamington Priors Gas Company, the members of the Circle visited Leamington Spa on Wednesday, June 10.

The visitors were welcomed by Alderman Harold Mason, M.B., J.P. (Chairman of the Company), Dr. Haynes (Director), and Mr. R. S. Ramsden (General Manager and Engineer).

GAS AND GAS APPARATUS FOR DOMESTIC USE.

A perusal of a publication such as "The Ideal Home," especially in the advertisement portions, quickly convinces one that the trend of modern ideas is towards the reduction, and, as far as possible, the elimination, of some of the tedious and humdrum duties connected with the home. It is truly said that "a woman's work is never done," and it is not surprising, therefore, that the housewife of to-day should turn her thoughts towards a solution of the problem. That solution, as we all know, is to be found in gas.

Gas, properly and efficiently used, lessens the drudgery attendant upon the work in the home to-day. It rests with us to see that no effort is spared to bring this truth home to the public, and to acquaint them with the manifold uses to which our commodity can be put. We must hammer away unceasingly, striving to create that first vivid impression so necessary to ensure a lasting effect.

From continued observations due to constant daily touch with the public, it would appear that, while a large number are, to a certain extent, enlightened in respect of the uses of gas, there are still an appalling number not so well informed. The need for us to proclaim gas is more than ever pressing in such cases. The time has gone by when resting on our oars we can, with complacency, await orders. Our competitors are no longer content to let us have it all our own way, as in the past; and once we let them get in, it will possibly be no easy matter to get them out. Among other expressed reasons for the change-over is, I find, either an insufficient or an unreliable supply of gas, which brings me to my first point.

Supply Pipes.

We may classify this section under three heads—namely:

Past.—Buildings already piped.

Present.—Buildings in course of erection.

Future.—Buildings to be erected.

With regard to the first, we cannot, of course, do anything with the supplies already in. We have to put up with conditions such as are found; and it is here that we find ourselves paying for the practices of the past, when pipes were run without any particular thought being paid to possible future requirements. I dare say all of you can cite cases where orders have been turned down on account of either expense in renewing, or inconvenience of having new and proper-sized pipes run.

This, of course, more particularly applies where consumers are in residence. It is, as a rule, readily overcome in the case of a change in tenancy, when the work of running or renewing supply pipes can be done while the premises are in the hands of the decorators. Even in such premises we should keep an eye on the possible requirements of the future. If we have an order for (say) one fire, and the position runs adjacent to that of a possible future one, it is surely politic to see that the supply run will, if necessary, be ample for both. I know that in some districts this is done, but it might not be so in all cases; and while we are endeavouring to standardize gas apparatus, it might be well to consider the standardization of supply pipes. The point I wish to press is that we should endeavour to put in the maximum size supply, in order to save extra work and expense later on. This will greatly minimize complaints such as we now get regarding insufficient gas. We cannot always be wise before the event, but we can, and should, profit by the lessons of the past.

With regard to the second point, that of buildings in course of erection, we are here in a better position. In these cases the gas undertakings have previously been consulted in reference to the running of services, supply pipes, &c., and we may look forward to a healthier condition of things in general. In those cases where the carcassing of new houses is in the hands of the undertaking or their contractor, we can assume that the work will be carried out in an efficient manner; but should the work have been left to a local plumber, it is just as well to inspect the piping before it is covered up.

Regarding the third point, this is where we can, with the co-operation of architects and builders, so arrange matters that the installation of apparatus, either at the time the house is first occupied, or at some future date, will give every satisfaction in the matter of an adequate supply of gas. Here it is that, when given the opportunity of viewing the plans of the house, we can recommend really satisfactory supply pipes. I do not wish to weary you with specifications; but the tables due to Mr. Stephen Lacey, and published in the "Gas Salesman's Diary and Handbook," give the necessary information.

Lighting.

All will admit that competition as regards lighting is on the increase. The terms of many housing contracts now being decided are largely responsible for the change-over in Government houses; and in the case of those of a better type the architects and builders follow the lead given them—in goes the wiring, and potential users of gas for lighting purposes are lost. In many cases the desire of the occupant is never considered; otherwise I am convinced the result would be different. We know that gas is the cheaper, the light obtained is less harmful to the eyes, the ventilating properties are greater, and maintenance is less costly.

In what way can we combat this competition? We must first turn our attention to the enemy within our gates. I refer to the local ironmonger and other shops retailing so-called gas fittings. The insidious practice which has been going on for years, unchecked, of exposing for sale lengths of brass tubing, often with faulty and leaking ball joints and lever cocks, and which are misnamed pendants, together with the equally badly made brackets, and numerous inefficient burners and shoddy globes, must be fought until, by legislation, we can prevent the flooding of the market with these totally inefficient and unsuitable fittings. Very few of the public are able to discriminate between good and bad fittings; and as the latter are usually less costly, it is not difficult to understand how they find their way into houses. It is up to gas undertakings, therefore, to see that their fittings are beyond reproach.

A little demonstration in the adjustment of a burner is not only helpful, but is usually appreciated. It is better to do this than to take it for granted that the buyer understands all about it.

Much harm may be done by the wrong selection of a shade. How often does one meet the customer who wants (say) a red shade to illuminate the table and also give a good light round the room! A little tactful advice as to why such a shade will not fulfil the dual purpose results in the selection of a different colour, and the customer goes away feeling both pleased and satisfied.

There are two outstanding points which are always made the most of by our competitors—flexibility of control, and dirty ceilings. To the first we reply, "Pneumatic switches;" and though to a gas man they are simple enough, yet, to the general public, they appear to be elaborate pieces of mechanism. I think the cost of installation and the uncertainty of the pilot light militate against their use, and again I do not think they are pushed as much as they might be. Switches which we have had in use in the Birmingham showrooms for many years are still working satisfactorily; and it is an infrequent occurrence for anything to go wrong. Thousands of consumers use by-passes; and as no additional attention is necessary in the case of a switch, there is no reason why a greater number should not be installed. Possibly, as I have just mentioned, it is a question of price.

In connection with switches, it is recommended that where the tubing is let into the walls of buildings it should be run through lead piping, to counteract the action of the lime in the mortar.

With regard to the question of dirty ceilings; as the burning of gas must always necessarily be associated with heat, so must the discolouration of ceilings, more or less, be present where gas is used as an illuminant. We, however, know that the benefits derived where gas is the lighting agent more than compensate for the cost occasioned by the extra cleaning of the ceiling. Our competitors, while using this as a strong argument against gas, are careful not to mention the fact that the incandescent mantle, acting as a miniature sun, sheds a ray of soft light around the room, and the heat so generated causes an upward flow of air which

draws with it germ-carrying dust and organic impurities exhaled from the lungs and skin, cremating and depositing them on the ceiling, and thus sterilizing the air and making it far purer at breathing level than is the case where electricity is used.

I should like to stress the point that much can be done by both the indoor and outdoor staffs in assisting consumers in the economical use of gas for lighting by the judicious selection of the right size of burner. Unless the hall is a large one, a medium, or even bijou, burner will suffice, as will the latter for the landing, bathroom, and less important bedrooms. For principal bedrooms universal size burners should be fitted. In the scullery a medium burner will provide a good light for the gas cooker. The kitchen should have a full-size burner.

In the dining room or lounge, if brackets are also in use, a one-light pendant, preferably fitted with one of the cluster lights now becoming so popular, and suitably shaded, will provide, as a general rule, sufficient illumination for the dining table, or, in the case of the lounge, for the centre of the room. Much will, of course, depend on the size of the room; and local conditions must necessarily be taken into account. In the absence of switch lighting, I strongly advise by-passes to all burners where the periods of use are intermittent (except where they are unavoidably placed in draughty positions). The by-pass tubes require occasional attention, but the advantages accruing from their use easily outweigh their cost and the slight attention involved.

One more point. You regard competition in lighting as a sign of the times. Well and good. Has it ever struck you that manufacturers of lighting fittings and burners are themselves partly to blame for the change-over, by reason of their neglect to keep the public acquainted with the latest improvements? Commercial firms with goods to sell advertise their productions either by pamphlet or through the Press. Gas apparatus makers are doing splendid work, both for themselves and for us, in the advertising of cookers, fires, and hot water appliances; but where do you come across advertisements in regard to lighting fittings, except in trade catalogues, which the outside public never see? This point, to me at any rate, is a very important one, and I would like to see the "B.C.G.A." devoting a little more attention to this section of our supply. Their work in other spheres is invaluable; but I am convinced that, were the public acquainted with a few facts in regard to lighting, in the same way as they are provided with information regarding our other forms of activity, we should retain a good proportion of users of gas for illumination purposes.

COOKING.

Turning now to the question of cooking in the home, it may very truthfully be said that the gas cooker is the housewife's best friend.

As a labour-saving device, compared with the old solid fuel range, it is pre-eminent. It is far cleaner, more convenient, adds greatly to the comfort in the home, and is more economical. A turn of the tap, a light, and it is ready for use. The remarkable improvements which have been embodied in the present-day cooker, both in respect of design, cleanliness, and efficiency, are something of which the various makers may be justly proud. To-day we have a piece of apparatus which is good to look at, and which therefore finds additional favour in the eyes of the ladies; something which is easy to clean; and fitted with burners of an efficient type which are more economical in use than the old type with the attendant top bar which conducted the heat away from the point where it was required most.

The white enamelled sides and door do away with much labour. A wipe with a cloth is all that is needed.

The most fastidious customer can now be catered for in regard to a cooker. We have a variety of patterns from which to choose, all the same in a way, yet different, and it is here that the salesman can do an enormous amount of good for the industry in general, and his own undertaking in particular, by a careful inquiry into the wishes of his client before recommending any one particular piece of apparatus. Customers sometimes have peculiar ideas, and their likes and dislikes should be studied in order that the transaction may be satisfactory alike to the purchaser and the undertaking. Little differences should be pointed out; and it is often the case that such differences may coincide with their own ideas, and be the deciding factory in selection.

The eye-level type of cooker is a particular boon to many people who previously found the low position of the oven inconvenient. This type should always receive attention when the question of a cooker is being discussed. Unfortunately it requires a good deal of space to accommodate it, and the prices of some models are rather high. The "Standard" one-level is a most convenient type where space is limited, as the oven and hotplate can be fitted separately. There are also other makes which permit of this being done, and no difficulty need be found in meeting all conditions.

The neat white-enamelled topped stand comes in for many praises from the ladies, who appreciate the ease with which the space under the cooker can be cleaned.

There is an ever-increasing number of high-grade cookers being sold either outright or on hire-purchase terms in Birmingham. They are daily replacing those now installed on permanent hire; and it is seldom that one of the latter variety is ordered for new houses of the better type.

Other appliances, such as grillers, hotplates, &c., are frequently asked for. These can be supported either on stands made for the purpose, or on brackets. Whatever the type, the same remarks as regards adequate supply hold good. Nothing less than $\frac{3}{4}$ in. should be run. How often does one hear of decent-sized grillers and hotplates being fed from a bracket supply? It is important, too, when selling grillers, to give the fullest particulars as to the capacity of the apparatus. Some people expect to be able to cook a small joint in the oven, even in the type not provided with bottom burners; and much disappointment will be saved if the matter is thoroughly explained to the purchaser at the time.

Before I close this section of my paper, there are one or two points to which I should like to draw the makers' attention. They are taken at random, but have been the subject of complaints at one time or other. They are as follows:

Badly-Fitting Oven Doors.—In some cases several thicknesses of paper can be inserted between the door and its frame. Besides a loss of heat in the oven, this is a fruitful cause of rusting of the bright parts of the door.

Griller Burners.—Nothing is so objectionable as the smell caused by broken cones of the flame. Most griller burners now being fitted are of the "Roller" type, and cases have been found where the burner, when revolved to the grilling position, instead of remaining fixed, has a decided tendency to swing back.

Badly Spaced Burners.—In order that large kettles and saucepans may be used, sufficient room should exist between the burners. In a small hotplate this may be somewhat difficult, but it is a point which should not be lost sight of.

Oven Linings.—I suggest plain green or grey, not mottled. The former are more easily cleaned on account of their smoother surface.

HEATING.

The gas fire is to-day one of our biggest assets. This is not to be wondered at when we consider that for intermittent use, or service up to five or six hours' duration, gas is as cheap as coal, taking labour into consideration. Medical men are in increasing numbers are installing them in their homes, and in consulting and waiting rooms, and, further, are wholeheartedly recommending them to their patients. What better testimony could we have?

Architects and builders, though not helping as much in the matter of lighting, are certainly our friends when it comes to heating. Architects and others concerned in the building of new houses are being catered for specially by the introduction of the gas fire interior. These interiors are being made in many attractive designs and sizes, and are rapidly replacing the coal grates in bedrooms. Thousands of new houses have been so fitted, and we look forward to the day when they become standard practice. They not only affect a reduction in building costs, but—what is more important from our point of view—ensure the use of a gas fire, with consequent increase in consumption.

Another model of interest to builders is the "Teale" fire, the fitting of which enables the owner to have either a gas or a coal fire at will. The transition from one to the other takes but a few seconds.

A good gas fire, properly installed, advertises itself. It is up to us, therefore, to see that those we supply are the best obtainable, in regard to both design and efficiency, and that the fixing is carried out in a way that will give satisfaction to the consumer.

Once again I should like to emphasize the importance of an adequate supply. I can conceive of nothing more likely to cause irritation and annoyance to a consumer than, after delaying the event on account of some possible doubt, to have a gas fire installed, only to find it practically useless on account of a poor supply. It may be the pipes; it may be that the meter will not stand up to the additional call. In Birmingham due allowance is now made for increased consumption of this kind by fixing a larger meter free of cost. This will undoubtedly prevent future complaints regarding poor supplies.

I should like incidentally to remark that in dealing with defective supplies generally where the cause is due to local stoppages, we now clear these at a nominal charge. This is proving a boon in hundreds of cases, and besides improving our relations with the consumer by enabling his appliances to function as they should, is resulting in an increased consumption of gas.

The old type of fire and method of fixing once in vogue did much to account for the tale of the "Bowl of Water." Many people to-day judge the present-day fire from the same standpoint. Customs die hard. Don't let a faulty chimney be the cause of a revival of the "Bowl of Water" question.

As appearance counts for a great deal, especially with the ladies, care should be taken when fixing sheet iron to see that any portion visible at the back of the fire conforms to the general outline of the grate.

If a fire has to be fitted on a wood floor it is essential that it should be protected either by sheet iron, a concrete slab, or, better still, a tiled slab. The latter can now be obtained in a variety of shades and colours to harmonize with existing surrounds and hearths, and makes a first-class job.

In bedrooms, nurseries, and similar positions where there is a likelihood of dresses or other inflammable material coming in contact with the radiants, a fireguard should be fitted. The small

ss wire guard takes up very little ce, and is an excellent protective de- e. For nurseries or the children's play- m the heavier standard type of guard uld be advised.

A gas fire cock with loose key is safer n the usual thumb cock. The latter be easily turned by children, and even the process of sweeping the floor. The bability may be remote, but the possi- ity is present.

Full-way union cocks should always be d, for obvious reasons.

With regard to the running of supplies oss hearths, much depends upon cir- nstances. In the case of new houses, where alterations to the grate and arth are in progress in others, it is ad- able, if not essential, that the supply uld be carried under the hearth to a table position before the tiles are laid. may mean extra trouble and expense, t will be seen to have been worth while en the job is finished.

Regarding the type of fire, thanks to e makers, who are to be congratulated their productions from the viewpoints efficiency, design, and finish, there are ny types to choose from. As every ss of consumer is now catered for, the ection should be easy. In the case of es rented on simple-hire terms, the ailable patterns may be narrowed down a certain few; but even here the choice not a difficult one.

Where the consumer personally visits showroom to inspect the various types fires, the fullest particulars should be tained by the salesman regarding size d aspect of room, together with any formation in the matter of outside walls d glass surface, and also the purpose r which the room is used—*i.e.*, whether quired to be heated quickly and only ed for a short time, or whether longer riods can be taken in the heating-up. This will enable him to recommend fire of suitable size, and also saves the tside man a lot of extra work should it necessary to re-select the fire on the emises. Where the latter has to be one, the impression created on the con- mer is not a good one, nor does it assist e good relationship which should exist tween the indoor and outdoor staffs. here the order is taken actually on the emises, the district man will, of course, ve no difficulty in recommending the ght fire.

If, after discussing the matter at his use, the consumer requires to see the e before placing the order, an appoint- ent should be made for a meeting in the owroom. Whenever possible, of course, e outdoor representative will meet his stomer. Should this not be convenient, owever, we, in Birmingham, invite the ient to call to see a certain salesman ho has previously been supplied with all e facts of the case, and is therefore ady for the interview. It is found that this method much unnecessary delay saved, the customer can be shown suit- ble models right away, and further, ap- reciates what may seem a special atten- on.

Where it is desired to cover up an open- ng or grate, quite a good job can be made ith the art metal surrounds now avail- ble. A new shade called "white finish" particularly suitable for the "art lver" fires; and it is possible to com- lete the set with hearth plate and curb match. Customers should be advised ot to allow articles to be dragged across he hearth plate, as scratches are easily ade.

It is worth remembering that an ugly r unsuitable grate will utterly spoil the ppearance of a nicely-finished high-grade re. To quote but one instance, a client ished to have an art silver finished fire nstalled in a room where there existed a roken-down black grate. He was ad- ised to have an art metal surround fitted, n order to make a good job of it. Not wishing to go to this expense, he decided to put up with the appearance, and left his order. Before he left the building, however, a few words warned him of the disappointing appearance which would result from his choice, and he was asked to think it over. He did, and the result was an order for a surround and hearth plate to match. He later called and expressed his satisfaction with the installation.

Regarding duplex taps, I personally think it advisable, where the size of the room and the purpose of its use permit, to recommend the larger size with duplex tap. The increased radiant surface allows of quicker heating up, the duplex can be put into action, and the room kept at a suitable temperature on a reduced consumption. It has been found that a drop in efficiency occurs when the flame is turned-down below three-quarters of its full capacity, and, as regards appearance, who would prefer the half-dead aspect of a turned-down flame to the very much alive appearance of fully-fed radiants, even though the latter may be reduced in number?

At least one bedroom fire should be fitted with a boiling burner.

Flueless stoves, radiators, &c., should only be allowed in well-ventilated halls, corridors, and such places, and not in bedrooms and apartments where, if used for a long time, their convected heat would tend to warm up the air unduly, to the discomfort of the occupants.

We are sometimes asked to fit apparatus of the radiator type in large rooms, to assist either a coal or a gas fire. Though not ideal, I see no reason against this, provided the client is made fully aware of our ideas on the question of radiators in living rooms. A syphon stove so fitted would answer admirably; but if the consumer insists on a gas-heated radiator, the fullest instructions should be given regarding the cleaning of the burners, with a view to preventing as far as possible any unpleasant odour. The floor and wall should be protected, and a wall shield added in the case of a radiator, to minimize discolouration of the wallpaper.

A word of caution regarding syphon stoves. The burner fitted is of the governor type, and made to pass a certain volume of gas. Should the governor get out of action, and allow a greater quantity of gas to pass, serious sooting-up will occur.

Other heaters of the flueless type are now to be found everywhere, but, though they are admirable things when used under proper conditions as regards ventilation, position, &c., the greatest care should be exercised to see that their sphere of usefulness is fully pointed out to a customer.

Hot Water.

The demand for hot water in the home is a very pressing one. The generally accepted method of obtaining it is by means of the kitchen range boiler. This may not be a matter of great moment to owners of large residences where servants are kept, but to the little English servantless home it is an entirely different matter.

The coal range at its best is a dirty, extravagant, labour-making business, requiring more or less constant attention, and the dreaded job of cleaning flues. That this is being realized is evidenced by the increasing number of hot water appliances now being installed in both old and new houses.

For a one-point service such as the bath, the geyser is the best apparatus; for two points such as a bath and a scullery sink, a geyser and one of the small but useful patterns of water heaters is specially adapted for this purpose. In the case of a house requiring several positions to be served, then we have the circulator or "Califont" boiler.

Taking the bath first, we have in the geyser just the means of supplying the necessary quantity of hot water quicker and cheaper than by any other means. There are many different patterns to choose from, and I should like to make a few observations on their selection and use. Let the pattern you sell be of approved quality, and do not stint the price. Cheapness in a geyser refers to price only—they are dearer in the long run. Do not recommend one of small capacity. The three to four gallons per minute size has been found the minimum for general use. It costs a little more, but the point which is very frequently forgotten is that the makers' average claim is a rise of 40° Fahr. only for the stated capacity. Let me put it another way. Suppose you sell a geyser rated at 2½ gallons per minute. In the summer months the temperature of the water at the inlet may be 55° to 60° Fahr. Allowing a rise of 40°, and an outlet temperature of 100° Fahr., it will take approximately ten minutes to obtain 25 gallons.

Suppose the geyser is required during the winter, the inlet temperature will now be nearer 40° Fahr., which, with the 40° rise, gives us an outlet temperature of only 80° Fahr. In order to bring this up to our 100° Fahr., we reduce the flow to about 1¾ gallons per minute—thus taking over fifteen minutes to supply the 25 gallons. This is equal to an increase of over 50 p.ct. in the time the apparatus is working. It will thus be seen that the life of the small geyser will be very much shorter, and the time taken to supply the hot water longer, than is the case with the larger apparatus. Many people require water at considerably higher temperature than 100° Fahr., and it has been found in practice that, during the colder periods, the 2½-gallon size takes even twenty minutes, whereas we should aim at a ten minutes' maximum. With regard to this guaranteed supply, I consider it would be an advantage if the makers arranged for a greater rise than 40° in the capacity ratings.

A geyser should preferably be fitted with a dual gas and water valve, ensuring immunity from damage should the water supply either fail or be turned off. Interlocking taps, if soundly and strongly made, and of good design, are safe enough, but there is always the possibility of damage to the apparatus should the water fail.

The fixing of geysers is dealt with very thoroughly in the pamphlet recently issued by the National Gas Council, of which doubtless all of you have a copy.

If the only other point at which hot water is required is the sink, then a "Hotwell" or similar boiler will fill the gap. This comprises a self-filling tank of varying capacity; and a quick-acting thermostat is also part of the equipment. This comes into action on the water becoming heated to a predetermined temperature, usually hot enough for dish-washing purposes, when the gas is reduced to an amount sufficient to maintain the water at that temperature. The reverse happens when the hot water is drawn off.

With these two appliances the demands of the small home can be met very readily. Should the geyser be required to serve the lavatory basin as well as the bath, this can sometimes be done by means of a swivel spout.

Where hot water is required throughout the house, from a single apparatus, a gas-heated circulator is as a rule fitted. This can be connected up to the existing hot water pipes. In Birmingham we prefer to run a separate flow pipe from the circulator to the hot water tank, thus ensuring the hot water getting there quickly—it can always be run off when once available.

Care should be taken to see that a large enough boiler is put in. It is no use fix-

ing a 40 c.ft. boiler to a 40 or 50 gallon tank, and expecting it to be an advertisement for gas. It is far better to supply one double this size, or reduce the capacity of the tank. For tanks up to 30 gallons, the 40 c.ft. size will be suitable, and for larger capacities the 80 c.ft. Thermostats are not to be recommended on the small circulator unless special attention is paid to the lagging of the pipes, with a view to preventing heat losses by radiation. Unless this is done, the radiation losses from pipes and hot tank may easily demand sufficient gas to make good such losses, and thus prevent the thermostat from coming into action. In the case of the larger boiler feeding a tank up to 45 gallons capacity, the thermostat would effect a saving; but steps should be taken to protect any long lengths of exposed piping, as well as the tank itself. It is the gas account at the end of the quarter which induces the customer to retain his confidence in the circulator—or otherwise. The question of labour saving, cleanliness, and convenience seems to be forgotten; the degree of such forgetfulness being influenced by the amount of the gas bill.

Another type of water heater for bath purposes is the pattern which contains some 8 or 10 gallons, which, after being heated-up, is expelled by the admission of cold water. The objection to this type is that the whole of the contents have to be heated, and the quantity of water available is dependent upon the size of the heater installed. Unless specially adapted for the purpose, as is done in a few patterns, small quantities cannot be obtained.

Outside taps and levers should be as simple as possible on all hot water apparatus. The public have no great liking for complicated pieces of mechanism.

With regard to fitting charges. As in the majority of cases the prospective purchaser first calls in the showroom for particulars as to cost and capabilities, I suggest that it would be in the interests of all undertakings if information regarding the approximate cost of fixing be supplied to the showroom assistants from time to time. Any misunderstanding regarding free fixing would thus be obviated. A better plan, of course, would be a standard price for the job, as is done in some of the southern counties, but possibly this will come along in our own area later. I am convinced that the high cost of fixing is, at the moment, a deterrent to many who would otherwise have hot water appliances installed.

My last water heater is the "Califont" boiler. Though we in the Midlands are not so well acquainted with it as are the people in London and the South, we cannot afford to ignore such an appliance, which, according to the opinion of users, is an excellent piece of apparatus for supplying hot water to all parts of the house. Working on the geyser principle, the gas is automatically switched on when hot water is drawn off, the closing of the tap reducing the gas again, resulting in economical working. Its consumption, when full on, is about the same as the largest geyser—viz., about 240 c.ft. per hour.

Wash Boilers.

In newly-built property the gas wash boiler is a foregone conclusion, and each day sees an increase in the number of boilers replacing the old solid fuel copper. There are possibly more individual firms making wash boilers than any other piece of gas apparatus. The wash boiler is a typical case of the urgent need for legislative interference in order to check the flow of galvanized contraptions which are being foisted on the public to-day, mostly by the speculative builder, whose interest ceases when the house is sold. Fortunately, housing authorities are now insisting on a better type of boiler than was the case a year or so ago. Inferior stuff is bound to react upon us, even though we have not had a say in the matter.

There are, however, some really excellent types on the market. Most of you have, I dare say, your own particular liking for certain models; and it is rarely that the better types made by firms of repute fail to give satisfaction.

All wash boilers should be fitted with draw-off taps, to facilitate emptying. Flue outlets are essential for the proper and complete discharge of steam and products of combustion. Loose wooden lids are preferable to metal. In those types fitted with a galvanized iron lid hinged at the back, there is a danger of scalding due to the uprush of steam into the face of the user, on the lid being raised. A wooden lid can be used as a guard.

A flue pipe should be taken from the boiler to the nearest chimney, or, failing this, through the wall. The terminating portion must be fitted with an efficient cowl or other device, to prevent down-draught. A lagged case will greatly assist in the economical working of the boiler, and will also keep the scullery cooler. Where space is a consideration, the new "Corna" boiler has its advantages. As with other gas apparatus, the best is the cheapest in the end.

Garage Heating.

The necessity for the proper heating of the garage—whether large or small—is becoming more generally realized. The fire insurance companies are naturally very strict concerning the type of heater to be installed, so that it behoves all undertakings to act warily, if unpleasant happenings are to be avoided.

We have at our disposal, among others, the Davis "Safety Garage" radiator, which can be confidently recommended both as to its efficient working and immunity from danger. Further, this appliance has been passed by several insurance companies in Birmingham. As you are aware, it is constructed on the principle of the Davy safety lamp; the air inlet at the bottom being covered with gauze, and the hot gases, after heating the cast-iron columns, passing away through the gauze-covered openings at the top. It is made in both two and four column sizes.

The heater will invariably be fixed at the end of the garage nearest to the radiator of the car; and if the ventilation of the building is normal, no trouble need be anticipated regarding the products.

Gas Irons.

While we cannot claim the gas iron as a means of increasing consumption, it enables us to obtain the goodwill of the housewife or other user, and thus assists in promoting amicable relationship between the undertaking and the consumer. There is, however, one proviso—viz., the iron must be an efficient one. If it is not, it can become a veritable nuisance.

It should be of just sufficient weight to enable it to be used for fairly long periods without fatigue. The burner should be capable of giving an easily regulated heat evenly distributed over the bottom of the iron. It should be capable of easy adjustment when necessary, and the method of doing this should be explained at the time of purchase. All metal parts should be nickelled, to prevent rusting.

I do not advise the use of a two-way tap above an inverted burner. I know it has been, and is being, done, but there is always the risk of vibrations from the movement of the flex being conducted to the mantle.

Towel Rails.

A gas-heated towel rail in a bathroom is a very convenient article.

Ewarts' new pattern consists of hollow tubes conforming to the appearance and shape of the usual towel rail, and is entirely self-contained, both as regards water and gas. One upright serves as a filling point for the water, and a luminous burner of about 5 c.ft. capacity is fit in the bottom of the other upright, spec provision being made for the escape waste products.

Miscellaneous.

We have the poker burner and the ci ing-iron heater. For the man there is neat little bracket with bunsen burn attached to which is a supporting ring accommodate a shaving mug. T bracket is nickel-plated, and the mug is aluminium.

Discussion.

Mr. Lewis (Birmingham), opening the d cussion, said that lighting did not get sufficie advertisement—at least, it did not get t same amount of advertisement as did other g apparatus. While they could still retain in make a profit by other apparatus, it was esse tial that they should do their utmost to reta the lighting load; and this could be done always advising good fittings. For econon and artistic lighting gas could still put up good fight. One of the chief things to strive for in gas apparatus was simplicity.

Mr. Ramsden was very pleased that h Directors had shown their appreciation of th Circle's visit by their presence. He was als pleased to see present Mr. Rayner, late Secr tary of the Gas Light and Coke Company and the members of the local Press. He con gratulated Mr. Price on the excellence of hi paper, and thought it was so good that h would like to see copies distributed among builders, ironmongers, and architects. H would like some information about th "Teale" fire. Could the discoloration o towel rails and other apparatus be prevented?

Dr. Haynes thought it would be a good idea to read the paper to the public, in which case it would be necessary to demonstrate th apparatus mentioned. People's objection to gas fires was the smell, but he, as a doctor always recommended gas fires, and told them that the smell had nothing to do with the gas; it was a question of ventilation. In all rooms the best ventilator was the chimney. He thought it was important that a gas fire should be large enough to heat quickly and effectively the room in which it was fitted.

Mr. H. Rayner added his congratulations and thought there was a great deal in the point raised of the necessity for advertising gas fittings. When he came to Leamington he had to take over, in his house, gas fittings that were ugly, badly fixed, and expensive. It behoved them to get the most artistic fittings possible, as there was no reason why gas fittings should not be elegant and artistic, and why they should not still be a force to help the sale of gas.

Mr. Hicks (Editor of the local Press) thought that it would be better if the men sent round to fix and attend to gas apparatus would give more information with reference to little defects which occasionally arose. Having used both, he much preferred gas fires to electric heaters.

Mr. Simmonds (Dudley) remarked that architects were most important men to the gas industry. He said how important it was to exercise great care in the fixing of gas fires, particularly in the backing-in of same. Wash boilers should be pushed in all new buildings, and they should do their utmost to influence architects in this direction. Harmony between the inside and outside staffs was very necessary. Above all, they should educate the fitter and give him all necessary information.

Mr. Lewis (Birmingham) agreed with Dr. Haynes that the question of ventilation was of the utmost importance, but they must be careful not to create draughts.

Mr. Dymond (Kenilworth) said that with pneumatic switches the by-pass tubes could be improved, for, in his opinion, they were too small and were liable to choke. Speaking of geysers, builders should be educated as to the necessity for fixing baffles in all installations. He also referred to the quantity of cheap and shoddy gas wash boilers on the market.

Mr. Rees (Birmingham) said that there was a large field open for business in the installation of modern apparatus in place of the older types. It was of particular importance that up-to-date gas fires should replace the older types with ball fuel. Gas was the working man's fuel, and all the modern higher-grade types of apparatus were within the reach of everyone, on account of the hire-purchase and simple-hire systems. Mr. Rees gave some figures

iting to the deposit of soot in Birmingham, said that, while they were primarily sellers gas, by the nature of the commodity they l they were also benefactors of the public.

Mr. COBB (Birmingham) said that all wash lers should be fixed with flues, which were essential as flues for geysers. He queried ether it was good to run the steam and products in the same flue, on account of increased condensation. He also referred the condensation in water heating apparaand asked if there was any way to comit.

Mr. HAMMOND (Coventry) explained the tches in use in their area, and said that y had been entirely satisfactory.

Mr. PRICE (Birmingham) replied to the nts raised.

A vote of thanks to Mr. Price, which s carried with acclamation, was prosed by Mr. BURDEN (Redditch) and onded by Mr. BECKETT (Oswestry).

After the discussion, the showrooms re visited, the window displays being eatly admired.

The members were then entertained to , Alderman Mason, Mr. Ramsden, and . W. J. Leist (Manager of the Spa mp Rooms) being present.

Mr. LEWIS, in proposing a vote of anks to their hosts for their excellent spitality, referred to the happy relations at existed between the manufacturing le and sales side of the industry. He ought what a splendid thing it would if a smoke abatement campaign could started from Leamington, noted as it is as a health resort. What an asset it ould be to the town to be able to say at there was no smoke at all in Leaington.

Mr. SIMMONDS (Dudley) seconded.

Alderman MASON, as a medical man, id how interested he was in the quesn of atmospheric pollution. Smoke insted atmosphere was greatly responsible r that dread disease, consumption; and nce New York had adopted measures of noke prevention, the number of cases of berculosis had decreased enormously.

Mr. W. J. Leist then conducted the embers over the Pump Rooms and aths, where new installations were being ade. The various treatments were exained.

A most interesting and enjoyable visit ded with the members visiting the beauful Jephson Gardens and the river.

Good Letter Writing.—Dealing with the bject of letter writing, in the "American as Journal," Mr. William F. Doolittle, Corspondence Adviser to the People's Gas Light id Coke Company of Chicago, expresses the inion that nothing in business contributes ore towards friendly relations with customers an good letters. One incompetent corspondent can destroy goodwill more rapidly an the entire personnel of an organization n build it up. Nevertheless, letter writing, in e gas industry, is given but scant attention. he general attitude seems to be that corspondence will take care of itself. Well, he ys, maybe it will; but it will become anæmic" from lack of nourishment. Educaon is a good preventive and a good tonic, if ken in proper doses and at regular intervals. ystematic training for correspondents is slow -hill work; but it is well worth while.

New Showrooms.—There will be found in is week's issue of the "JOURNAL" accounts the formal opening of two new gas showoms and offices, situated in different parts the country, one of them belonging to a ompany and the other to a Corporation. The wns are, respectively, Southampton and oughborough; and each is a substantial ainer by the step forward that has thus been ken. At Southampton the Mayor performed e ceremony, which was carried out at oughborough by the Mayoress. Much care design and thoroughness of attention to deil have evidently been bestowed in both ases, for the premises are tastefully furnished nd well equipped. A hint or two may be athered from a study of the account which is iven in the "JOURNAL" of what has been one in the towns named to add to the public nowledge of what can be accomplished by as and efficient appliances.

Decorated Lorry in the Castleford Pageant.

The decorated motor lorry of the Castleford and Whitwood Gas Light and Coke Company proved a great attraction at the local pageant held on Saturday, May 16, and was awarded first prize in the tradesmen's class. A bust of William Murdoch fixed on the cab top was very prominent in the bright sunshine, as no doubt all readers will agree after examining the photograph we reproduce. The geyser on the top of the display was continually revolving, being operated from the driver's seat, and much attention was drawn to this point.

The procession, which was above a mile in length, covered approximately 3 miles *en route*, and was viewed by some immense crowds.

Mr. Geo. F. Twigg (the Company's Engineer and Manager) is confident that the exhibit was well worth the trouble and expense involved.

Maintenance Notes for Gas Salesmen.—A useful booklet, written by Mr. Charles Dickens, of the Manchester Corporation Gas Department, and published by the Palatine Press, Manchester, is based upon extracts from a number of lectures on maintenance and distribution subjects delivered by the compiler while in the service of an Australasian gas undertaking. Dealing for the most part with lighting, the booklet also contains a valuable table giving the maximum gas consumption of the more common types of gas appliances. The section relating to the capacity of meters and pipes will also be found very useful. The price of this little volume, which contains thirty illustrations, is 4d.

Scottish Circle.

In the "SALESMAN" for last month was published a paper entitled "The Gas Salesman's Attitude to Advertising," by Mr. W. M. Mason, Manager of the British Commercial Gas Association. The author intended to read this paper at the May meeting of the Circle, but was unable to attend; and the paper was read by Mr. Charles Reay, Hon. Secretary of the Circle. There was only a short discussion.

The PRESIDENT (Mr. J. Jamieson) moved a vote of thanks to Mr. Mason.

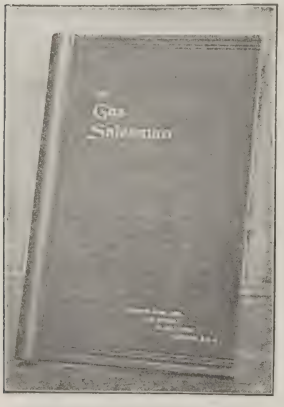
The following appointments were made for the 1925-26 session:

President.—Mr. N. S. Smith, Greenock.

Hon. Secretary.—Mr. A. B. Munro, Edinburgh.

New Members of Council.—Messrs. J. Jamieson, G. Lockhead, and J. Simpson.

Out-Door Advertising.—Persons who are anxious to ear-mark the return from each individual advertisement, should note a statement made by Mr. John F. Weedon, in the "American Gas Journal." Mr. Weedon declares that, generally speaking, it is a mistake to try to trace direct results from out-of-door advertising. They show in a gradual steady growth in the volume of business, and more particularly in a warmer and more friendly feeling on the part of the public towards the organizations. Out-of-door advertising is seen and read out of doors. People who see it are walking or riding; they are filling their lungs with oxygen, and the breezes are blowing the cobwebs from their brains. They are not thinking of business. The advertising signs they pass register on their sub-conscious mind, but they do register. One can test this out by checking-up the subjects of conversation introduced by one's travelling companions. Quite frequently one will notice matters mentioned that found their place in the mind through the medium of some billboard or poster which was recently passed, but not consciously observed.



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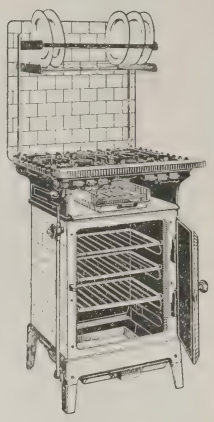

Gas Salesmen are specially invited to send for the booklet describing the Radiation "New World" Cooker.

Its automatic oven-heat control device is the most highly praised development in the Gas Industry since the Incandescent Lighting Mantle was produced.

ARDEN HILL & CO., Birmingham and London.

THE DAVIS GAS STOVE CO., Ltd., London and Luton.

FLETCHER, RUSSELL & CO., Ltd., Warrington and London.

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JOHN WRIGHT & CO., Birmingham and London.

RADIATION LTD., PROPRIETORS

CLARK'S "SEVERN" COOKER.

A Small Cooker and Griller suitable for Consumers living in FLATS OR SMALL HOUSES.

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Actual Makers of
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VERITAS LIGHT WORKS
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Everything for Gas Lighting Heating, and Cooking.
See Advert. on p. 1007 of "JOURNAL."

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Specialists in Gas Lighting

PARKINSON'S
"STANDARDISATION"
Methods of Construction
REDUCE MAINTENANCE COSTS
— OF —
GAS COOKERS :: GAS FIRES
— AND —
HOT-WATER APPLIANCES.
The Parkinson Stove Co., Ltd.,
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See Advertisement on p. III. centre of "JOURNAL."

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The oldest firm in the
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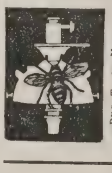
and ALL BRITISH.



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Printed (at the Chancery Lane Printing Works, Ltd.) for WALTER KING, LIMITED, No. 11, BOLT COURT, FLEET STREET, LONDON, E.C. 4.—Wednesday, June 24, 1925.

8.05
50

GAS JOURNAL

LIGHT ✦ HEAT ✦ POWER ✦ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

VOL. CLXX. No. 3241.] LONDON, JUNE 24, 1925. [77TH YEAR. PRICE 1s.

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All Types for ACID, &c.
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Any Capacity.
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The oil being sprayed by gas, no air or steam enters the mains.

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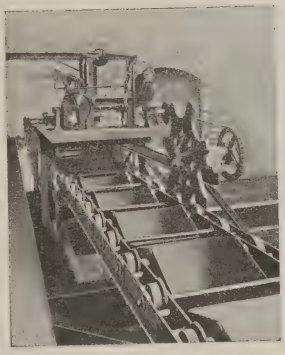

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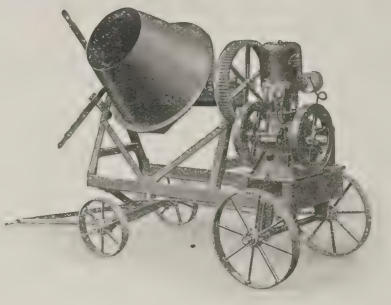

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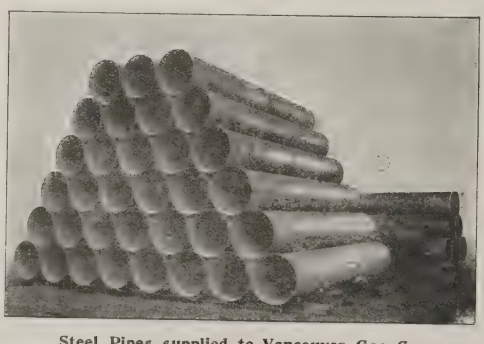
With Socketted, Flanged or other Type Joints.

DIMENSIONS SUPPLIED ARE 14" DIAMETER AND UPWARDS, AND LENGTH 18 TO 26 FEET.



Steel Pipes supplied to Vancouver Gas Co.

Advantage over Cast Iron Pipes: Saving in Cost of Transport and Laying, owing to less Joints, and in Repairs as unaffected by Variations in Temperatures.

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"S.P. SILICA" 95% RETORTS AND FOR BYE PRODUCT COKE OVENS.

"SILCO" RETORTS 90% SILICA.

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OUGHTIBRIDGE, Near SHEFFIELD.

ESTABLISHED 1858.

Plastic Silica Cement.

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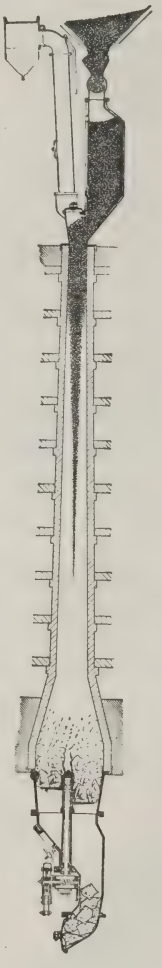
Highest Grade Silica Bricks and Blocks for Gas Works.



Glover-West Vertical Retorts *for* DURHAM COALS

	CUBIC FEET PER DAY
* NEWCASTLE-UPON-TYNE	5,500,000
* DARLINGTON - - -	3,000,000
* GOTHENBURG - - -	2,500,000
* BERGEN - - - -	750,000
* BLYTH - - - - -	1,500,000
* COPENHAGEN, EASTERN -	3,000,000
,, VALBY -	4,500,000
FULHAM (Gas Light & Coke Co.)	7,000,000
NINE ELMS ,,	7,500,000
PLYMOUTH - - - -	4,000,000
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Total capacity over 2,800
Tons of Durham Coals per day

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HERE ARE FACTS & FIGURES ABOUT

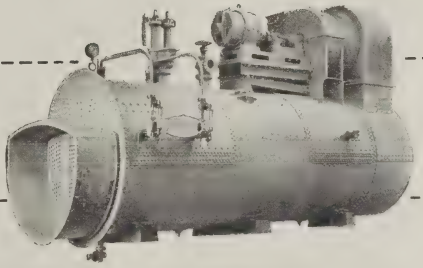
SPENCER-BONECOURT

KIRKE

PATENT WASTE HEAT

BOILERS

TUBE EFFICIENCY UP TO 94%.



British Waste Heat Boiler Patents Nos. 130234, 140851, 172752, 186801, 193895, etc.

No. 1. **1 TON STEAM *from* WASTE-HEAT FOR EVERY 1¼ TONS *of* COAL CARBONISED**

is being obtained from waste heat alone with Spencer-Bonecourt Kirke Patent Waste Heat Boilers.

No. 2. **5¼ lbs STEAM** PER lb OF COKE

put into the producers is being obtained from waste gases at **700° C.** with these Boilers.

No. 3. **4½ lbs STEAM** PER lb OF COAL

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No. 4. **5 LARGE LANCASHIRE BOILERS FIRED WITH COKE & COKE BREEZE, HAVE BEEN SHUT DOWN by 2 SMALL SPENCER-BONECOURT KIRKE Patent WASTE HEAT Boilers**

No. 5. *No Economisers used in any of the above performances.*

No. 6. **WATER GAS PLANTS** are being fitted with these boilers.

No. 7. **14 REPEAT CONTRACTS** have been received from One Firm alone.

No. 8. **HORIZONTAL, VERTICAL & INCLINED RETORTS** are being fitted with these boilers.

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No. 10. These Boilers have been installed in the Continents of **EUROPE, ASIA, AMERICA, AND AUSTRALIA.**

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MANUFACTURERS OF

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SPECIAL BRICKS, TILES, AND BLOCKS FOR ALL MODERN GAS SETTINGS, AND EVERY DESCRIPTION OF FIRECLAY GOODS.

REFRACTORY INSULATING BRICKS

FOR

RETORT BENCHES, WASTE HEAT MAINS, BOILER SETTINGS, ETC.

SPECIAL FEATURES: LOW CONDUCTIVITY.
HIGHEST REFRACTORINESS.
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SPECIALITIES Hydrated Oxide of Iron for Gas Purification, and of different Strengths to suit conditions of Purification, Sulphuric Acid (free from Arsenic) for Sulphate of Ammonia Manufacture, Recovered Sulphur, and Prussiates of Soda, Spent Oxide bought on Sulphur and Cyanide Contents, Tar and Gas Liquor purchased. *See our Advertisement last week.*

The Pre-payment Price-changer

Pioneers in the manufacture of Slot Meters having the whole of the attachment accessible from the front.

This attachment (which is shown being fitted to a "Ranelagh" Meter at our Chelsea Works) is a slot mechanism of the highest efficiency and reliability. It is one of the chief reasons for the ever-increasing sales of the

"Ranelagh" GAS METER

There are no change wheels and there are no loose screws or parts to become detached. Alterations in the price of gas are effected (from the front of the Meter) in a few seconds. The disc has a wide range, varying from 5 to 47 feet in the penny Meter, or 60 to 564 in the shilling type.

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GEORGE GLOVER & CO., Ltd.

Dry Meter Manufacturers and Repairers,
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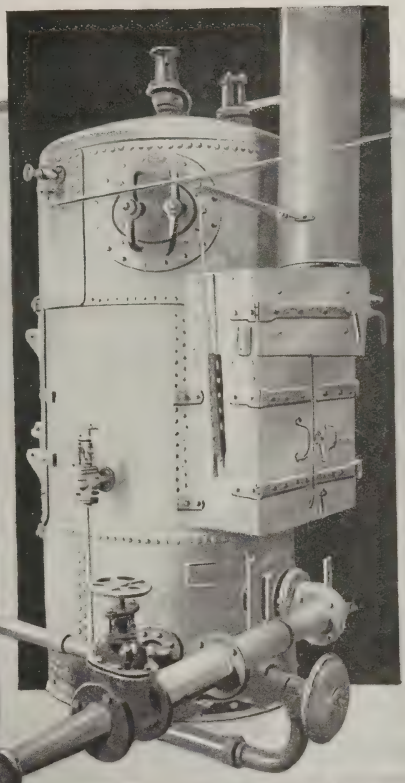
Branches: Ranelagh Meter Works, East Park View, LEEDS.
74, Diamond Street, CARDIFF. City Meter Works, Port Street, MANCHESTER.



Can be made in 22 sizes

This illustrates a boiler 4'-6" diameter 10'-0" High 100 lbs. W.P.

Using Town's Gas

Actual tests on this boiler showed

Evaporation per hr. 1062 lbs.

Gas used per hr. (60°F. & 30" Hg.) 3378 cu.ft.

Temp. of Gases leaving boiler 403°F.

CO_2 content 11·3%

Burner Equipment supplied by BRITISH FURNACES LTD CHESTERFIELD

COCHRAN

GAS-FIRED BOILER

(WOODALL-DUCKHAM-COCHRAN SYSTEM)

The Woodall-Duckham Vertical Retort and Oven Construction Co.. (1920) Ltd.

The Boiler combines all the well-known advantages of the Cochran Patent Vertical Multitubular Boiler over other boilers, with those inherent in the use of the well-known burner equipment supplied by British Furnaces Ltd., which may be briefly summarised as follows:- Saving in labour. No stoker is necessary, because the supply of gas is controlled by a governor, and the supply of water by an automatic feed regulator. There is no coal to cart to the site, no ashes to take away, and no storage space required. There is no smoke, soot, dust or dirt. The steam production can be regulated to suit demands, and when no steam is wanted, no fuel is being burned. The efficiency of the Boiler **is constant at any rate of steaming.**

Write for full particulars

EFFICIENCY 88% NETT

Telegrams— "MULTITUBE ANNAN"

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COCHRAN & Co ANNAN Ltd ANNAN · SCOTLAND

See the GAS-FIRED COCHRAN BOILER under Steam on STAND No. K351 — adjoining West Gate — Palace of Industry, BRITISH EMPIRE EXHIBITION

A COMBINED SERVICE

Gas & Electricity

MESSRS

DRAKE & GORHAM, LTD.,

will be pleased to inform Gas Companies regarding the alternative which they can adopt and the cost that will be involved.

In many cases Waste Heat can be utilized so as to reduce the cost of production of Electric Current.

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Branch Offices:

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TWO PROFITS

ONE OVERHEAD CHARGE

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GENUINE WROUGHT IRON

Tubes FOR GAS SERVICES

More durable than Steel.

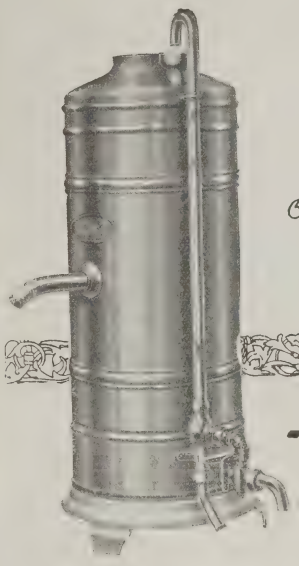
The Scottish TUBE COMPANY, LIMITED

34 ROBERTSON STREET GLASGOW

High-Grade: Efficient: Moderate in price-

the Davis

"Shamrock"



-the geyser to choose

The Davis "New Shamrock" Geyser is an improvement on the very popular "Shamrock" model. It is constructed on the "sealed" principle, of strong copper, polished and lacquered. Interior detachable and readily accessible, with waterways heavily tinned, and standardized parts. Efficient condensation arrangement. Body rotatable to place outlet in any position.—Send for illustrated price lists.

¶

The "New Shamrock" No. 62 heats 2-2½ galls., and the No. 63 heats 3-3½ galls., per minute, *i.e.*, raises temperature of the water 40 degrees. Supplied (1) with pilot gas cock and union, (2) with interlocking taps, pilot gas cock and unions, and (3) with automatic valve, pilot gas cock and unions. The geysers can also be had in nickel-plated or oxydised bronze, if required.

The **Davis**

GAS STOVE CO. LTD. 60, OXFORD ST. LONDON W1. RADIATION LTD. PROPRIETORS

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GAS ENGINEERS AND CONTRACTORS,

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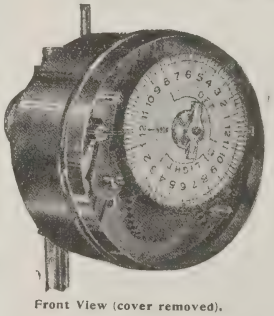


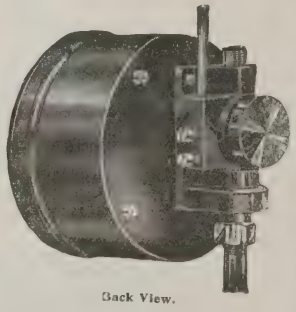
Front View (cover removed).

THE LONDON CLOCK CONTROLLER

IS IN

A CLASS BY ITSELF

WE NOW MAKE A SPECIAL CONTROLLER FOR SHOP LIGHTING TO OPERATE ON PRE-DETERMINED DAYS ONLY.



Back View.

THE GAS METER CO., LTD.,

238, Kingsland Road, LONDON, E.2,

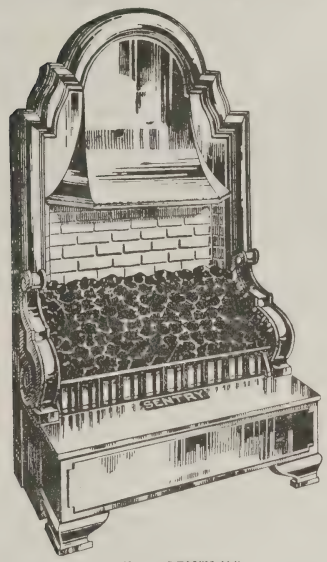
AND AT OLDHAM, DUBLIN, AND MANCHESTER.

THE

SENTRY

REGD. TRADE MARK

GAS FIRES



THE "SENTRY" SELF-CONTAINED GAS FIRE

A really efficient and attractive substitute to the traditional coal grate is to be found in the "SENTRY" Series of Gas Fires—made in three forms: Inset, Self-Contained, and Dog Grate.

The glowing mass of radiant fuel makes an immediate appeal to all users of Gas Fires, and perhaps what is more important, to the potential consumer who still clings to raw fuel in spite of the labour, dust, and dirt.

An interesting feature is the radiant, which is vertical for the lower 2½" before inclining backwards to carry the loose fuel—thus ensuring a maximum of radiant efficiency and reflection on the Trivet top.

The Self-Contained Fire, made in 12", 14", 16", and 18" sizes, has the appearance of a built-in fire, but is fixed by a fitter without the assistance of other tradesmen, which the built-in type frequently necessitates.

An ample hood is provided to remove the products of combustion and ventilate the apartment, giving at the same time a pleasing proportion of convected and radiant heat.

FULL PARTICULARS AND PRICES WILL BE FORWARDED ON APPLICATION.

A "SENTRY" Coke-fired Hot Water Boiler fixed in the kitchen or scullery provides hot water for all domestic purposes.

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R.A.A.

SAND BLAST

An Improved and Economical Method of Cleaning

GAS COOKERS AND PARTS

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STANDARD FIRE CEMENTS.

Purimachos (Regd) (Plastic)

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Unsurpassed for setting and repairing Retorts, washing the insides of Retorts to form a Glaze, and for all other purposes where strong, gas-tight joints are essential.

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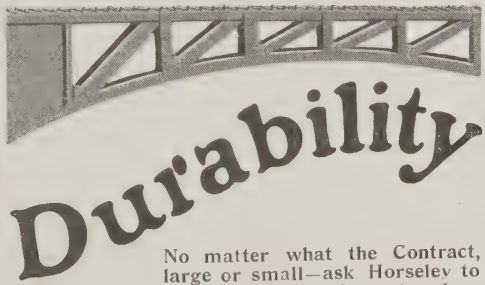

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"HORSELEY BUILT" Steelwork is in existence all over the world—lasting evidence of Durability, Strength, and soundness of design.

We shall be pleased to place our exceptional knowledge of Constructional work at your disposal.

ASK HORSELEY TO QUOTE.

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CONSTRUCTIONAL ENGINEERS
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"LUX"

GAS PURIFYING MATERIAL

ORDER NOW

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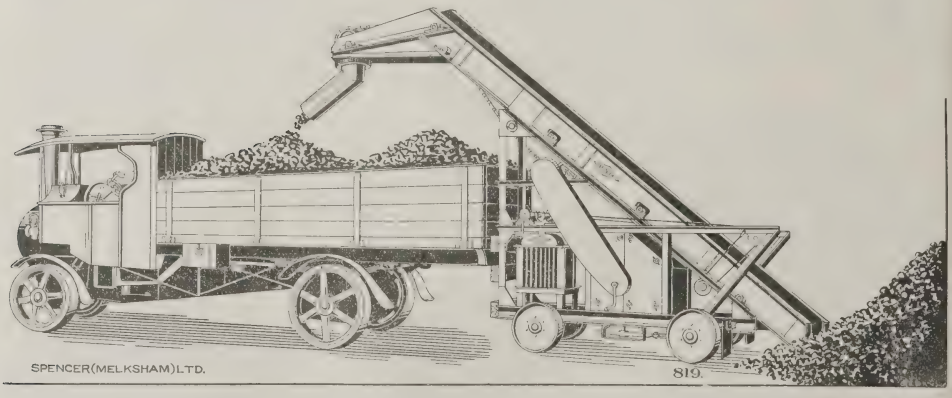
SPENCER

Material Handling in Gas Works.

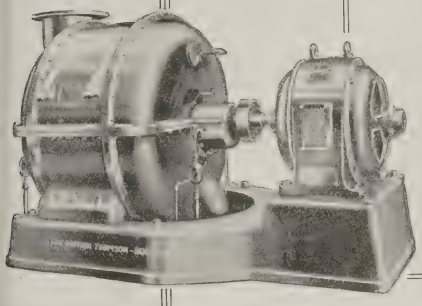


Spencer Automatic Loader for Coke, etc.

This Loader will handle coke from ground storage to motor wagons at minimum expense.

SPENCER (MELKSHAM) LIMITED
THE COAL HANDLING EXPERTS

Motor-driven Gas Exhausters



The long life of B.T.H. gas exhausters is undoubtedly due to the construction of the impeller discs and vanes, each of which is in the form of a single solid steel casting. There are no rivets to corrode or work loose, and perfect balance is continuously maintained.

Careful attention to all such details in design has reduced maintenance costs to a minimum, while ensuring constant and reliable service, even under the most strenuous conditions.

Further particulars of motor and steam-turbine driven B.T.H. gas-exhausters will be sent on request.

The British Thomson-Houston Co., Ltd.,

Electrical Engineers and Manufacturers,

Head Office: Rugby. ——— London Office: "Crown House," Aldwych
Works: Rugby, Birmingham, Willesden, Coventry, and Chesterfield.

IF YOU ARE KEEPING STATISTICS—

of cost of Lighting Maintenance—

USE THE

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BRITISH MADE

and let us prove to you that

"The best is the cheapest in the long run"

Prices and free samples may be had upon application.

THE PIONEER RAMIE MANTLE & STILL THE BEST.

MAXIMUM LIGHT
MINIMUM COST

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VERITAS LIGHT WORKS
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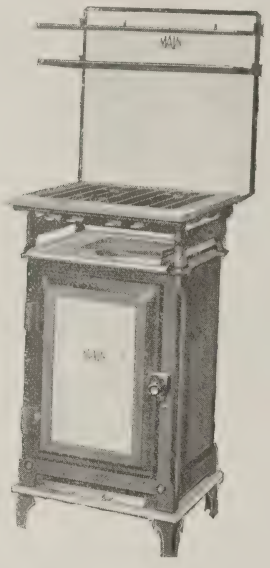
FEATURES OF THE MAIN "MAINSTAY" COOKER



The "Mainstay" Cooker, besides its handsome appearance, its efficiency in operation, and its easily cleaned exterior and interior, has many advantages that appeal to the Gas Undertakings — notably those in simplicity of construction, standardization and fewness of parts, and in interchangeability. Moreover, there is a degree of accessibility in the "Mainstay" that has won the appreciation of those who know the worries usually connected with "district" complaints and the general overhaul of Cookers.

The "Mainstay" Oven Gas Rail can be disconnected and removed in a moment. The packing can be inspected by simply removing the back. The undertop is removable, and can be taken out by loosening its one screw with the thumb and forefinger. The Cooker can be dismantled entirely in five minutes, or dismantled and re-assembled in a quarter of an hour.

The story of the "Mainstay" Booklet illustrates and describes many other interesting features of this popular Cooker. Send a postcard for a copy.

The

MAINSTAY

Cooker

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Established 1850

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DEMONSTRATION METERS

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SIGNAL LANTERNS FOR MOTOR TRAFFIC.
CATALOGUE ON REQUEST.

Arkon

DRAUGHT RECORDERS

will help you to find and maintain the best draught to suit your boiler firing.

They are real fuel savers on any boiler plant.

Send now for pamphlet to:—

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SPECIALISTS IN BOILER HOUSE AND WORKS CONTROL.
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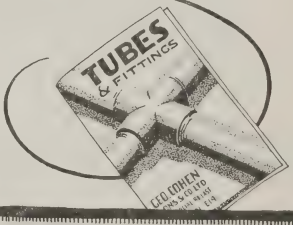
All your requirements are contained in our Catalogues

Write for Catalogue G to-day.



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SONS & CO. LIMITED
600 COMMERCIAL RD. LONDON. E.14.

JOHN BROWN & CO., LTD., Colliery Offices: ROUNDWOOD, Nr. ROTHERHAM.
OWNERS OF THE FAMOUS
Aldwarke, Rotherham, & Dalton Main Gas Coals
As used by the principal Gas Companies of the World.
ALSO PRODUCERS OF THE BEST SOUTH YORKSHIRE ASSOCIATED HARDS (BARNSLEY BED).

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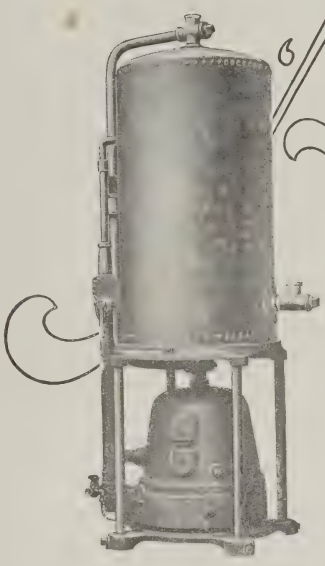
Arden Hill's "Acmefont" — the Simplicity Builder's Set



This economical gas-heated hot-water outfit cannot be surpassed for simplicity and reliable working. It is "built like a battleship," for service and hard wear. It requires few connections, and the gas supply is controlled by a patent Thermostat.

Fitted with economy valve, allowing 5 galls. or whole contents to be heated at will.

Provision for connecting to existing coal-range boiler, if required.

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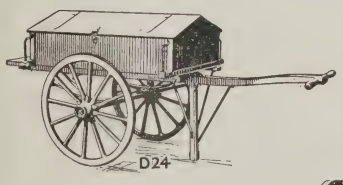

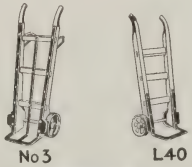

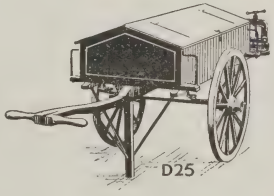

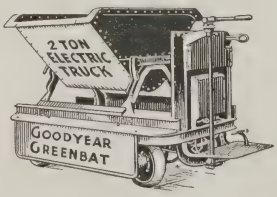

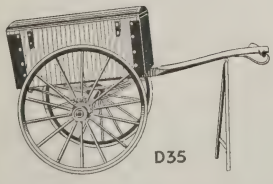

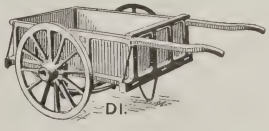

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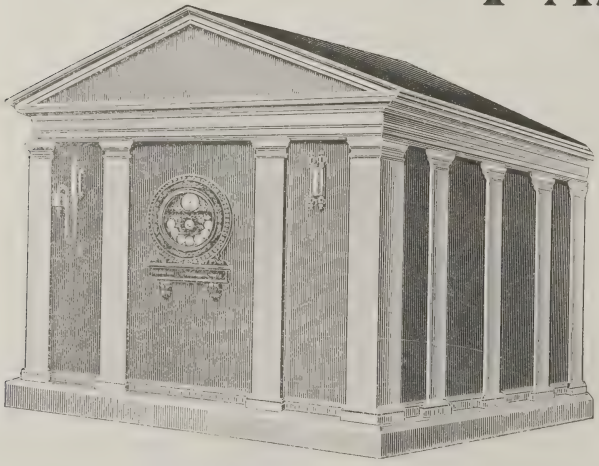

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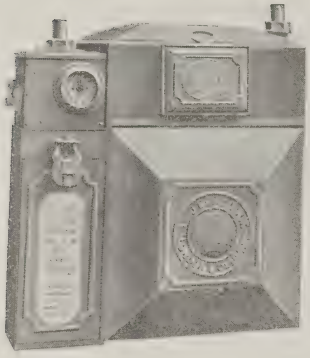

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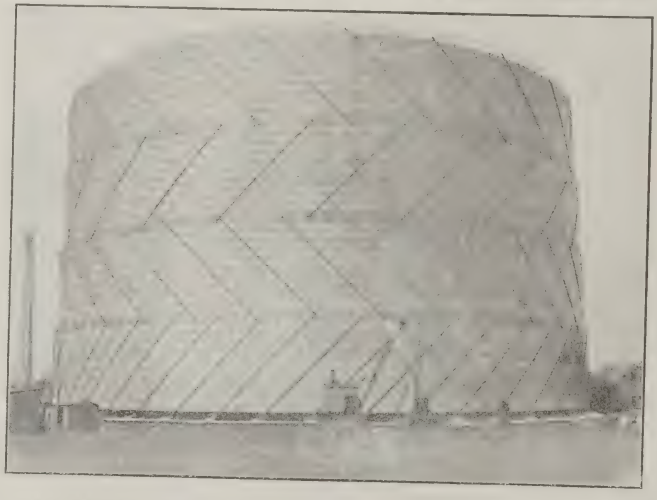

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JAMES AMPHLETT,
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Council Offices,
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Sealed Tenders, endorsed "Tender for Gas Coal," addressed to the Chairman of the Gas Committee, to be Delivered at my office on or before Saturday, July 4, 1925.

R. BARRETT,
Engineer and Manager.
Gas-Works,
Clitheroe,
June 16, 1925.

BOROUGH OF MIDDLETON.

GAS PIPES.

THE Town Council invite Tenders for the Supply of 750 Yards of 6-in. CAST-IRON SOCKET and SPIGOT PIPES, with Turned and Bored Joints, in 12-ft. Lengths.
Specification and Form of Tender may be obtained from the Engineer, Gas-Works, Middleton, Lancs.
The Corporation do not bind themselves to accept the lowest or any Tender.
Tenders, endorsed "Gas Pipes," must be Delivered to the undersigned not later than Tuesday, July 7, 1925.

J. P. WALMSLEY,
Town Clerk.
Town Hall,
Middleton, Lancs.
June 16, 1925.

BOROUGH OF MIDDLETON.

(GAS DEPARTMENT.)

STEAM TUBES.

THE Town Council invite Tenders for the Supply of WROUGHT-IRON STEAM TUBES and FITTINGS for a period of Six Months, commencing Aug. 1, 1925.
Full Particulars and approximate quantities may be obtained from the Engineer, Gas-Works, Middleton, Lancs.
The Corporation do not bind themselves to accept the lowest or any Tender.
Tenders, endorsed "Steam Tubes," must be Delivered to the undersigned not later than Tuesday, July 7, 1925.

J. P. WALMSLEY,
Town Clerk.
Town Hall,
Middleton, Lancs.,
June 16, 1925.

LANCASTER CORPORATION.

(GAS DEPARTMENT.)

TENDERS are invited from Public Works Contractors for EXCAVATING, LAYING, and RE-INSTATING 1500 Yards of 18-in. GAS MAIN, from Gas-Works to centre of Town.
Tenders to be sent to the undersigned by July 8 next.
Particulars and Specification may be had from GEO. DIXON, B.Eng., A.M.I.C.E.,
Engineer and Manager.
Gas-Works,
Lancaster,
June 16, 1925.

HAVERHILL URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

TENDERS FOR COAL.

THE Haverhill Urban District Council invite TENDERS for the Supply of 1500 Tons of BEST GAS COAL (Screened or Unscreened) to be Delivered at the Haverhill (L. & N.E.R.) Station, in such quantities and at such periods as may be ordered from time to time, between the 31st day of July next and the 30th day of June, 1926.
No Form of Tender is provided, nor will be supplied.
The Council reserve the right to divide the Contract as they think fit, and do not bind themselves to accept the lowest or any Tender.
Sealed Tenders, endorsed "Gas," to be Delivered to me on or before the 15th day of July, 1925.

JAMES BEASLEY,
Clerk.
Haverhill, Suffolk,
June 18, 1925.

COMPANY NOTICES.

THE GAS LIGHT AND COKE COMPANY.

NOTICE is Hereby Given that the TRANSFER BOOKS of this Company, SO FAR AS THEY RELATE TO CAPITAL STOCKS, WILL BE CLOSED at 4 o'clock p.m. on Wednesday, the 1st day of July next, and will be RE-OPENED on the morning of Saturday, the 1st day of August next.
Dividends payable in respect of the half-year ending the 30th inst., will be remitted by warrant forwarded by post on the 31st of August, 1925, to those Proprietors who were the holders of Capital Stocks when the Transfer Books were closed, or their Authorized Agents.

By order,
WILLIAM LYLE GALBRAITH,
Secretary.
Chief Office:
Horseferry Road,
Westminster, S.W. 1,
June 16, 1925.

STOCK ISSUES.

By Order of the Directors.
NEW ISSUE OF ADDITIONAL ORDINARY CAPITAL.
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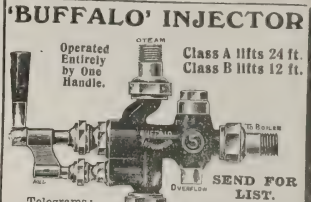

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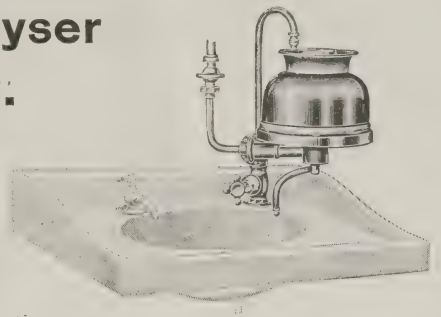

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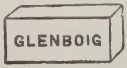
TRADE 

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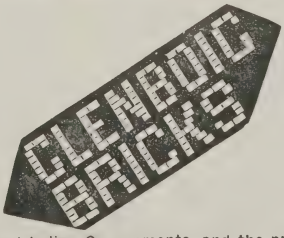

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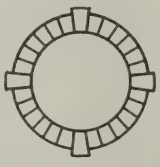

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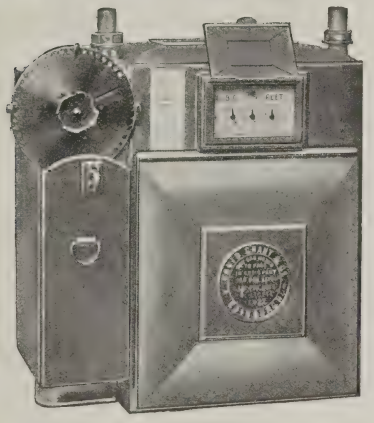

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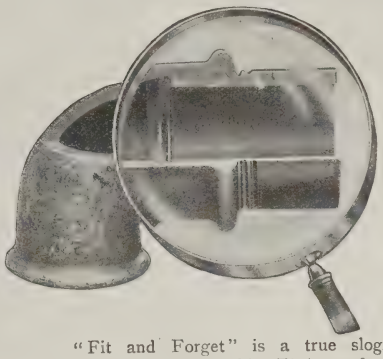

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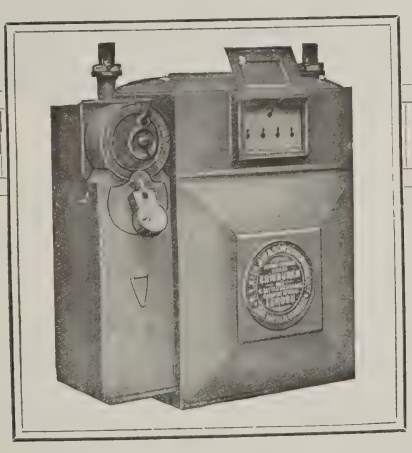

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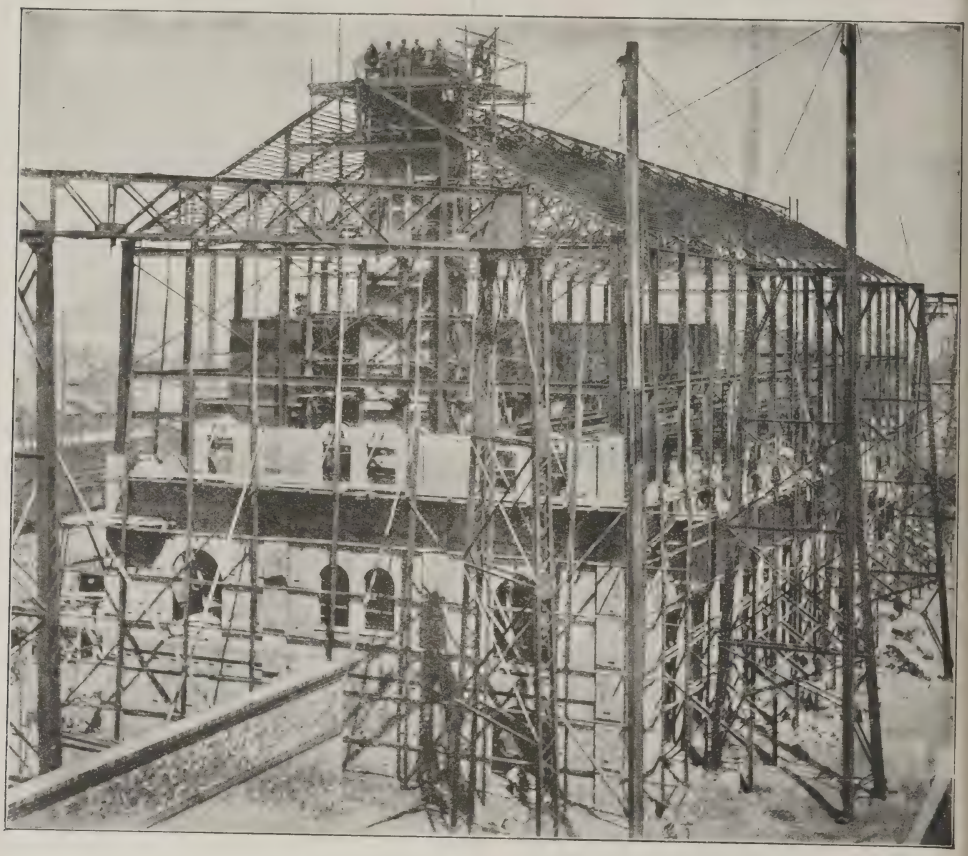

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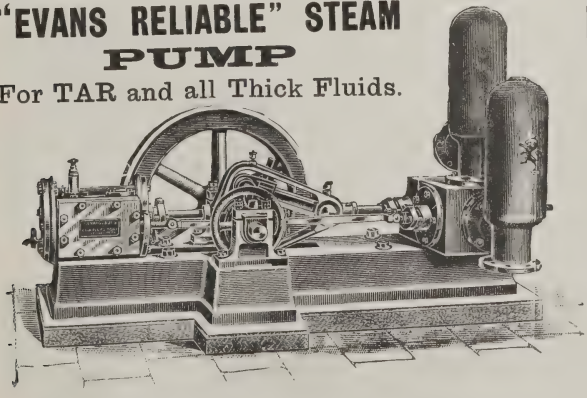

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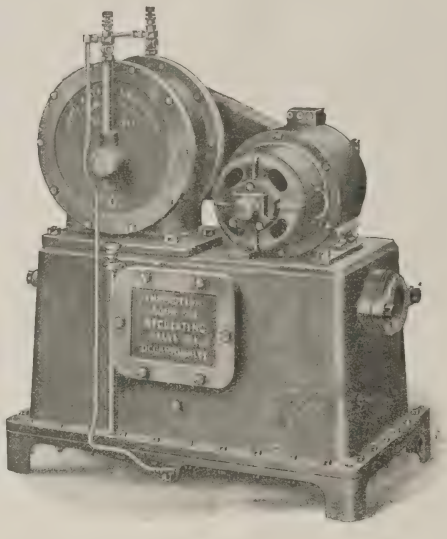

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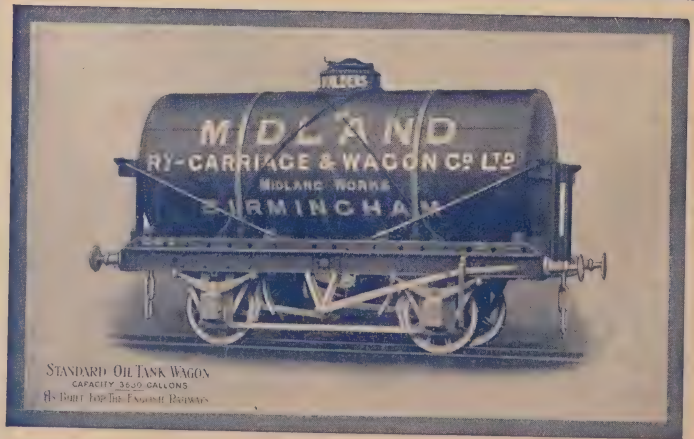

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